MONTHLY WEATHER REVIEW.

Editor: Prof. Cleveland Abbe.

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INTRODUCTION.

The Monthly Weather Review for August, 1899, is based on reports from about 3,000 stations furnished by paid and voluntary observers, classified as follows: regular stations of the Weather Bureau, 154; West Indian service stations, 10; cotton region stations, 127; corn and wheat region stations, 133; special river stations, 132; special rainfall stations, 48; voluntary observers of the Weather Bureau, 2,220; Army post hospital reports, 27; United States Life-Saving Service, 14; Southern Pacific Railway Company, 96; Canadian Meteorological Service, 32; Mexican Telegraphic Service, 20; Mexican voluntary stations, 7. International simultaneous observations are received from a few stations and used, together with trustworthy newspaper extracts and special reports.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. Curtis J. Lyons, Meteorologist to the Hawaiian Government Survey, Honolulu; Senor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Señor A. M. Chaves, Director-General of Mexican Telegraphs; Mr. Maxwell Hall, Government Meteorologist, Kingston, Jamaica; Capt. S. I. Kimball, Superintendent of the United States Life-Saving Service; and Capt. J. E. Craig, Hydrographer, United States Navy.

The Review is prepared under the general editorial supervision of Prof. Cleveland Abbe.

Attention is called to the fact that the clocks and self-registers at regular Weather Bureau stations are all set to seventy-fifth meridian or eastern standard time, which is exactly five hours behind Greenwich time; as far as practicable, only this standard of time is used in the text of the Review, since all Weather Bureau observations are required to be taken and recorded by it. The standards used by the public in the United States and Canada and by the voluntary observers are believed to conform generally to the modern international system of standard meridians, one hour apart, beginning with Greenwich. Records of miscellaneous phenomena that are reported occasionally in other standards of time by voluntary observers or newspaper correspondents are sometimes corrected to agree with the eastern standard; otherwise, the local meridian is mentioned.

FORECASTS AND WARNINGS.

By Prof. E. B. Garriott, in charge of Forecast Division.

Over the greater part of the United States the month of August, 1899, was notably free from severe atmospheric disturbances.

The meteorological event of the month was a West Indian hurricane, which appeared east of Martinique on the morning of the 7th. During the afternoon and night of the 7th this storm devastated the more southern of the Leeward Islands of the Lesser Antilles, and on the 8th caused the loss of hundreds of human lives and destroyed millions of dollars' worth of property in Porto Rico. Moving thence north of west the disturbance crossed the Bahama Islands during the 11th and 12th, attended by a considerable loss of life and property, and from the 13th to the 17th skirted the south Atlantic coast of the United States, after which it disappeared in the direction of Newfoundland. At Porto Rico and Hatteras, N. C., where its vortex passed near regular reporting stations of the Weather Bureau, the hurricane was of exceptional severity, and at Hatteras it will go on record as the severest storm within the recollection of the oldest inhabitants.

From the time this hurricane appeared within the region of observation until it disappeared off the Virginia coast accurate advices regarding its character and course were telegraphed along the line of its advance and preceded its arrival by periods which varied in length from a few hours in the Leeward Islands to thirty-six and forty-eight hours along the south Atlantic coast.

A history of this storm appears under the heading "The West Indian Hurricane of August 7–17, 1899," and its track is platted on Charts IX–XII.

From the 29th to the 31st a tropical storm of moderate intensity moved from the vicinity of Dominica westward over the Caribbean Sea and recurved northward during the early days of September. A discussion of this storm will appear in the Monthly Weather Review for September, 1899.

Several severe storms of a local character occurred during the month. On the 1st and 2d a violent storm visited Carabelle, Fla., and vicinity, causing the death of six persons and destroying vessels, property, and crops to the value of $575,000. On the 2d a group of storms, which in places assumed the intensity of tornadoes, occurred in the Middle Atlantic States. On the 10th about two million bushels of wheat in North Dakota were destroyed by hail. The causes which produce storms of this class are, as a rule, so obscure that it is not possible to define or localize the region in which they will develop.

No special warnings were issued during the month by the forecast officials at Chicago and San Francisco.

Mr. B. S. Pague, Forecast Official at Portland, Oreg., reports that on August 26 the grain crop was threatened with destruction by continuous rains and that a positive assurance from that office that a change to fair, warm weather would occur within thirty-six hours prevented wholesale men from calling in traveling men and a suspension of credits, which would have seriously embarrassed rural merchants, bankers, and, especially, farmers.

AREAS OF HIGH AND LOW PRESSURE.

During the month of August there were six high areas and nine low areas sufficiently well defined to be traced on Charts I and II. During this month the center of high and low is very difficult to determine, and very often the point fixed is only approximate.

The accompanying table exhibits the principal points regarding the origin, velocity, and disappearance of these highs and lows, and the following description is added:

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long W.	Length.	Duration.	Daily.	Hourly.
High areas.		°	°		°	°	*Miles.*	*Days.*	*Miles.*	*Miles.*
I	1, p. m.	48	130	12, p. m.	46	58	3,840	11.0	349	14.5
II	8, a. m.	36	123	18, a. m.	44	62	4,260	10.0	426	17.7
III	20, a. m.	52	108	23, p. m.	43	80	2,040	3.5	583	24.3
IV	23, p. m.	44	101	28, a. m.	48	59	2,520	4.5	560	23.3
V	26, a. m.	46	112	28, a. m.	48	76	1,740	2.0	870	36.2
VI	22, a. m.	45	129	†2, p. m.	45	60	3,240	4.5	720	30.0
Total							17,640	35.5	3,508	146.0
Mean of 6 paths							2,940		585	24.3
Mean of 35.5 days									497	20.7
Low areas.										
I	*28, p. m.	43	116	3, a. m.	49	67	2,730	5.5	496	20.7
II	1, a. m.	40	115	5, p. m.	36	94	2,130	4.5	473	19.7
III	4, a. m.	40	94	6, p. m.	36	76	1,110	2.5	444	18.5
IV	4, p. m.	51	117	10, a. m.	44	85	2,130	5.5	387	16.1
V	8, p. m.	52	114	14, a. m.	50	61	2,580	5.5	469	19.5
VI	12, a. m.	26	78	20, p. m.	41	69	1,380	8.5	162	6.8
VII	13, a. m.	44	116	23, a. m.	43	70	3,480	10.0	348	14.5
VIII	20, a. m.	43	118	23, a. m.	53	104	1,260	3.0	420	17.5
IX	24, a. m.	53	117	26, a. m.	51	99	810	2.0	405	16.9
Total							17,610	47.0	3,604	150.2
Mean of 9 paths							1,957		400	16.7
Mean of 47.0 days									375	15.6

*July. †September.

Highs.—Three of the highs, Nos. I, II, and VI, were traced from the North Pacific, nearly due east, to the North Atlantic. No. III was first noted to the north of Montana and disappeared over Lake Erie. No. IV began in South Dakota and disappeared over the Gulf of St. Lawrence. No. V began in extreme southwest Montana and was last noted in Ontario.

Lows.—Four of the storms, Nos. I, II, VII, and VIII, began in the middle Plateau region. Three more, Nos. IV, V, and IX, began to the north of Montana. No. III was first noted in north Missouri. No. VI was a West India hurricane, and was first noted off the southeast point of Florida on the 12th. Its motion, north or a little east of north, was extremely slow; it was last noted off Cape Cod on the evening of the 20th, having moved only 6.8 miles an hour. The motion of these storms, except the hurricane, was generally eastward. No. II was last seen in Arkansas; No. VIII, in Assinaboia; No. IX, in Manitoba; No. IV, in lower Michigan; No. III, off the middle Atlantic coast; No. VII, off the coast of Maine; and Nos. I and V, in the Gulf of St. Lawrence. During the progress of these lows the following maximum winds were reported on the coasts and lakes: On the evening of August 5, as No. III approached the middle Atlantic coast, New York City experienced a northwest wind of 64 miles an hour; the morning of the 6th Cape Henry reported a west wind of 56 miles; on the evening of the 11th, as storm No. V approached the upper Lakes, Chicago had a northeast wind of 52 miles. In connection with the very slow-moving hurricane, the following velocities were reported: Jupiter, a. m. of the 13th, north 52 miles, evening of the same day the same station reported 51 miles; a. m. of 15th Charleston had a northeast wind of 52 miles; evening of 16th Kittyhawk and Cape Henry had northeast 52 miles; morning of 17th Hatteras reported 74 miles, and on the evening of 17th it reported 105 miles, with an estimated extreme maximum velocity of 140 miles. At the 8 p. m. observation of 17th Hatteras reported a barometer reading of 28.62 inches, the lowest ever experienced on the middle Atlantic coast.—*H. A. Hazen, Professor.*

THE WEST INDIAN HURRICANE OF AUGUST 7-17, 1899.

While there is evidence that this hurricane had its origin far to the eastward of the West Indies its approach toward the region covered by reporting stations of the United States Weather Bureau was not indicated until the morning of August 7. At 8 a. m., seventy-fifth meridian time, of that date the hurricane center was east-northeast and distant about 150 miles from the Island of Dominica. At Roseau, Dominica, the barometer read 29.72 inches, with rain and wind from the northwest blowing at a rate of 12 miles an hour. Up to this time the maximum wind velocity at Roseau had been 18 miles an hour from the northeast. Immediately upon the receipt of the 8 a. m. telegraphic reports the Central Office of the Weather Bureau at Washington ordered hurricane signals at Roseau, Dominica, Basseterre, St. Kitts, and San Juan, Porto Rico, and sent advisory messages to all other stations in the Lesser Antilles and also to Santo Domingo, Kingston, Jamaica, and Santiago, Cuba, with information regarding the position and probable course of the hurricane. This information was also telegraphed to important seaports on the Atlantic and Gulf coasts, and furnished the Bureau of Navigation, Navy Department, the Maritime Associations, and the Press. On the afternoon of the 7th hurricane signals were ordered at Santo Domingo.

During the next twenty-four hours the hurricane traveled in a west-northwest direction at a speed of about 16½ miles an hour, crossing directly over the Island of Guadeloupe early in the afternoon, and passing 50 to 75 miles south of St. Kitts late in the afternoon of the 7th, and reached the southeast coast of Porto Rico shortly after 8 a. m. on the morning of August 8. At St. Kitts the lowest barometer, 29.268 inches, was reached at 5 p. m., and the maximum wind velocity was 72 miles an hour from 4:22 to 4:27 p. m., with an extreme velocity for one minute of 120 miles at 4:40 p. m. Along this portion of the track the destruction of life and property was most marked on the islands of Guadeloupe, Montserrat, and St. Croix, which lay along the path covered by the storm's vortex.

Tuesday, August 8, 1899, will go on record as a day during which Porto Rico experienced one of the most disastrous hurricanes noted in the history of the West Indies. In the morning the hurricane center struck the southeastern part of the island and moved west-northwest, passing very near and apparently to the northward of Ponce. The lowest barometer reading noted at the Weather Bureau station at San Juan was 29.23 inches at 8.30 a. m. Reports of readings of aneroid barometers in the possession of voluntary observers who were located nearer the path of the storm's center show a barometric gradient which will account for the terrific violence of the hurricane. At Guayama a reading of 27.75 corrected for elevation and instrumental error, was registered, and at Juana Diaz a reading of 28.11 inches was recorded at 9:30 a. m.

During the 8th the storm center continued a west-northwest course and reached the northeast coast of Santo Domingo the morning of the 9th. Hurricane signals were ordered at Santiago, Cuba, and all Cuban stations were notified of the position and course of the storm, and vessels in Cuban ports bound north and east were advised to remain in port. In

Santo Domingo the storm was severe in the northeast and north parts of the island, while in the southern part but little damage was done.

From the morning of the 9th to the morning of the 12th the path of the hurricane was without the region of observation, and during this period it moved from the northeast coast of Santo Domingo to a position some 50 miles south of Nassau, Bahamas, a distance of about 700 miles at a velocity of less than 10 miles an hour. In its passage over the Bahamas the storm was quite severe, and at Nassau a minimum barometer reading of 29.10 inches was reported. In the mean time all interests in its line of advance were from time to time advised of its calculated movements, and all shipping bound for the South Atlantic were informed of the danger of sailing for that region. The evening of August 10 Nassau, Bahamas, was advised to take precautionary measures in view of a probable hurricane visitation. By the morning of the 13th the storm center had reached a position off Jupiter, Fla., with a minimum barometer reading of 29.22 inches at 8 a. m.

The subsequent course of the storm lay off and nearly parallel with the south Atlantic coast of the United States, where, as shown by the detailed reports from Weather Bureau stations, herewith, it apparently acquired its greatest intensity in the region about Hatteras from the 16th to the 18th, with a minimum barometer reading of 28.620 at 8 p. m. of the 17th, an unprecedentedly low reading for the Hatteras station.

The following reports from points along the path of the hurricane contain data in detail regarding its character and effects from the 7th to the 18th, inclusive, and also indicate the action taken by the Weather Bureau to disseminate warnings of its approach:

Basseterre, St. Kitts, W. I., W. H. Alexander, Observer, Weather Bureau:

The day preceding the hurricane was the warmest of the season thus far, the temperature reaching 88°, and the afternoon was characterized by gusty, whirling winds from the northeast, with an occasional momentary calm, and by a hazy atmosphere, with scattered strato-cumulus clouds moving from the east rather rapidly, and above which there seemed to be a thin sheet of cirro-stratus clouds, through which the sun shone with a pale, sickly light. The sea was wonderfully clear, so much so that one could see very distinctly the stones on the bottom, but gave no sign of unusual agitation. The sunset was not marked by saffron skies, nor did the barometer, up to this time, show the slightest tendency to depart from its normal condition. At 3:30 p. m. the wind set in steadily from the northeast at the rate of 12 miles per hour, with a gradually increasing force. At 10:00 p. m. the barometer began to fall, and the wind, still increasing, had attained a velocity of 18 miles per hour. By 3:00 a. m. of the 7th the barometer dropped .01 of an inch, and the wind was blowing at the rate of 24 miles per hour, and there was an apparent tendency to cloudiness, so that by 5:30 a. m. the sky was almost entirely overcast with low clouds, from which frequent showers fell.

The storm came from the southeast and moved toward the northwest, the center passing near but a little to the southwest of St. Kitts. The behavior of the barometer before and during the storm is clearly indicated in the readings made at the time and given below, viz:

AUGUST 7, 1899.

8:00 a. m.	29.854	5:45 p. m.	29.299
9:00 a. m.	29.838	6:00 p. m.	29.330
10:00 a. m.	29.793	6:15 p. m.	29.357
11:00 a. m.	29.786	6:30 p. m.	29.379
12:00 m.	29.744	6:45 p. m.	29.416
12:20 p. m.	29.724	7:00 p. m.	29.441
1:00 p. m.	29.675	7:15 p. m.	29.506
1:30 p. m.	29.650	7:30 p. m.	29.546
2:00 p. m.	29.624	7:45 p. m.	29.566
2:30 p. m.	29.572	8:00 p. m.	29.603
3:00 p. m.	29.520	8:30 p. m.	29.655
3:30 p. m.	29.450	9:00 p. m.	29.686
4:00 p. m.	29.381	9:30 p. m.	29.704
4:15 p. m.	29.360	10:00 p. m.	29.716
4:30 p. m.	29.299	10:30 p. m.	29.726
4:45 p. m.	29.279	11:00 p. m.	29.737
5:00 p. m.	29.268	12:00 midnight	29.740
5:15 p. m.	29.270	2:45 a. m. (8th)	29.760
5:30 p. m.	29.287		

As shown by the above readings, the barometer made a decided start downward about 10:00 p. m. of the 6th and reached the lowest reading, 29.268, at 5:00 p. m. of the 7th.

The wind continued from the northeast until about 6:00 p. m., when it veered to the east, where it remained until about 8:00 p. m.; then it changed to the southeast and so continued to the end of the storm. The verifying velocity (45 miles per hour) began at 2:34 p. m. and ended at 12:25 a. m., the storm lasted, therefore, nine hours and fifty-one minutes. The maximum velocity (the greatest velocity for any five minutes) was 72 miles per hour, and occurred between 4:22 p. m. and 4:27 p. m. The extreme velocity (1 mile in the shortest time) occurred at 4:40 p. m., when the wind made 1 mile in half a minute, or at the rate of 120 miles per hour. The total wind movement during the storm was 478 miles, as follows, viz: from the northeast 196, from the east 112, and from the southeast 170.

The hurricane was accompanied by a light rain, the total amount of which was 1.28 inches. The heaviest rainfall occurred between 4:53 p. m. and 5:10 p. m. There was neither thunder nor lightning during the hurricane.

The order to hoist hurricane signals was received at 12:13 p. m. of the 7th, and diligence was used to give the warning the greatest possible publicity. A copy was given to the Daily Express, and a message was filed to the United States Consul at Antigua. To my surprise and disappointment the agent told me late that evening or early next morning that my message to Antigua was not sent; that it was "crowded out." I tried to reach Nevis but could not. That the entire Island of St. Kitts was warned in good time is shown by the fact that not a death resulted from the hurricane.

The office was besieged by those seeking information. Among those who called were the acting administrator, the president and cashier of the bank, the United States Consul, the inspector of police, the magistrate, and many others. It is remarkable how many people seek the Weather Bureau "under stress of weather." The following communications, illustrating the general feeling which prevails here relative to the Weather Bureau and its work, have been received:

ST. CHRISTOPHER, NEVIS,
ADMINISTRATOR'S OFFICE,
St. Kitts, W. I., August 12, 1899.

I beg to tender on behalf of the government and the public generally sincere thanks for the information and timely warning afforded by you as to the approach of the late destructive hurricane, whereby this island was, no doubt, saved from more serious damage.

I have the honor to be, sir, your obedient servant,

F. S. WIGLEY,
Acting Administrator.

CONSULAR SERVICE, UNITED STATES OF AMERICA,
St. Kitts, W. I., August 19, 1899.

I take this opportunity to express my sincere thanks to you for the service rendered by you on the 7th instant, and I have no hesitation in stating that the prompt and efficient manner in which you gave notice of the approaching cyclone was of the greatest benefit to this island, and was much appreciated by its inhabitants.

I am, dear sir, yours truly,

EMILE S. DELISLE,
United States Vice Com. Agent.

COLONIAL BANK,
St. Kitts, W. I., August 15, 1899.

The warnings and information given by you prior to and during the hurricane of the 7th instant, have proved very valuable and of the greatest use to the inhabitants of this island and must have been of similar value to some of the islands northwest of us, and the usefulness of the Weather Bureau must be considered as fully established.

Yours truly,

U. U. GEDDES,
Manager.

WEST LODGE,
St. Kitts, August 10, 1899.

Allow me to thank you for your courtesy on Monday the 7th instant, when I called at your office, and to express my appreciation of the timely warning you gave of the cyclone then approaching us, which was of great value to the people of this island, as they were able to make every possible preparation before the storm reached us.

I am, yours, respectfully,

F. W. DRATON.

ST. PETER'S RECTORY,
St. Kitts, August 19, 1899.

As I think it the duty of citizens on this island to testify their appreciation of the United States Weather Bureau, it affords me much pleasure in expressing my thanks for the great and valuable use of such an institution. Monday, the 7th of this month, showed us all the necessity of such an establishment. I for one can bear testimony to

your great skill, kindness, and readiness in affording the information which enabled us to use all the precautionary measures for our safety.

Hoping that you may continue in your invaluable post, I am yours, faithfully,

GEORGE ED. YEO,
Rector.

St. Martin, Dutch West Indies, C. W. Doelitzsch, Officer of Customs:

The morning of August 7, dense clouds, heavy and threatening, appeared at 8 a. m., with the appearance of cirro-stratus clouds to the windward, with heavy gusts of wind from the east-northeast, alternating with calms during the morning with heavy sea. During the afternoon the weather was gloomy and squally, with wind increasing from east-northeast and going to northeast. At 10:20 p. m. the barometer read 29.81, and the storm was increasing. This was the last observation taken of this hurricane.

Saba, Dutch West Indies, Mr. John B. Simmons:

At daylight on the 7th the barometer was noticed to have a downward tendency; at noon it had fallen two-tenths of an inch, with wind from east-northeast and strong. At 4 p. m. the wind was from northeast and increasing. The barometer continued to fall until 11 p. m., when I judged the wind to be from the north, after which it remained steady until midnight when it shifted to southwest and the barometer began to rise. The minimum reading by an aneroid barometer was 29.40 inches. There was no means of measuring the velocity of the wind, but I estimated it at 55 to 65 miles an hour. This island is high and mountainous and contains no low land. I know from reports that neighboring islands have suffered to a greater extent than Saba.

R. M. Geddings, Section Director, Weather Bureau, San Juan, Porto Rico:

For several days previous to the 8th the meteorological conditions had been peculiar. During the 3d and 4th the air was almost calm. There were, however, no indications of a hurricane until the morning of the 7th, when the barometer read 29.96. About noon of the 7th the sky assumed a hazy appearance and ragged cumulus and cumulo-stratus clouds were observed moving rapidly from the northeast. At that time a cablegram was received ordering up the hurricane signals and announcing that the hurricane was central east of Dominica. The barometer at that time read 29.91, wind northeast, velocity 12 miles an hour. The barometer continued to fall rapidly, and at 3 p. m. the sky began to be covered with thick alto-stratus and stratus clouds, the former moving from the southeast and the latter from the east-northeast. The barometer stood at 29.865. From that time on the sky became more and more overcast, the barometer fluctuated between 29.78 and 29.80, and at 5.25 p. m. light rain began and continued until 8.15 p. m. At 10 p. m. the barometer began a downward movement which continued until the lowest recorded reading was reached, 29.23, at 8.30 a. m. of the 8th, when it "pumped" violently and then began to rise and reached 29.55 at noon of the 8th.

The wind did not attain a high velocity until 2 a. m. of the 8th. At 5 a. m. of the 8th it was blowing hard and raining, both increasing until between 7 and 9 a. m. of the 8th, when the hurricane was at its worst, an estimated wind velocity of 85 to 90 miles an hour being reached.

Immediately upon the receipt of the hurricane signal order on the 7th, hurricane signals were ordered at Arecibo, Aguadilla, Mayaguez, Ponce, Arroya, Humacao, and Fajardo. The signals were displayed from the Weather Bureau office flag pole, and also from the signal flag on Fort Cristobal, the same pole from which all marine signals at this port are displayed. As soon as they were hoisted vessels began to move to a safe anchorage, and the warning was the means of saving many of them.

A peculiar feature of the storm was that there was practically no thunder or lightning. But two flashes of lightning were observed and they were not severe. During the afternoon of the 8th the rainfall was extremely heavy, continuing into the night. The total amount during the storm was 6.37 inches, of which 4.18 inches fell between noon and 8 p. m.

The hurricane center apparently passed over the City of Ponce. Several readings of barometers were made during the passage of the storm. At Guayama a reading of 27.80 was made on an aneroid barometer which has since been compared and found to read .20 inch too high; allowing for difference in elevation the reading of the instrument, corrected, was about 27.75 I was disposed at first to doubt this reading, but a report from the voluntary observer at Juana Diaz records a reading of 28.11 at 9.30 a. m. It thus appears that the center passed over the southern part of the island, and with such a barometric gradient its violence is not to be wondered at.

Reports from Ponce to date (August 16) show that already 500 bodies have been recovered, and it is thought that there are many yet to be found. In Humacao 60 persons were killed, and from every side come reports of tremendous loss of life and destruction of property. The smaller fruits and vegetables are reported as utterly lost, and of these, with bananas, are the principal food of the inhabitants, it can be seen that possible famine stares the island in the face.

The Bureau has been much complimented on its warnings here. A gentleman from Guayama told me that the warning was received in good time at that place, and was the means of saving much life and property.

The observer at Juana Diaz reports that the rainfall from 6 a. m. of the 8th to the same hour on the 9th was 11.20 inches. This report agrees with those from Ponce, where the rainfall is said to have been torrential, many of the deaths at that place being the result of drowning.

Along the military road from Coamo desolation reigns on every side. But two houses were left standing at Aibonito, and 6 persons were reported dead at that place. But two houses were left standing between Coamo and Aibonito, and the road was blocked in many places by huge boulders which were blown and washed down from the cliffs which border the road. The celebrated baths at Coamo were utterly destroyed. As San Juan is built of brick and the houses have thick walls and flat roofs comparatively little damage was done in this city.

The following are extracts from reports received from the various Weather Bureau displaymen in Porto Rico.

Mayaguez.—The authorities and all masters of vessels in port notified. A number of vessels which were about to sail remained in port, and the information proved most valuable to them. The lowest barometer was reached at Mayaguez at 1:25 p. m. of the 8th. In my experience of tropical hurricanes this is the severest that has chastened the island, nor have the oldest men heard of the like before. In the city the damage to property is large, and from the country the news is appalling. One-fourth of the coffee crop only will be saved, the loss of cane was considerable, and crops of minor fruits, which are the sustenance of the poor, have disappeared. The loss of life is greater than ever before, houses with all the inmates being washed away by the floods.

Aguadilla.—The wind began blowing about 8 a. m. 8th and increased in force to about 1 p. m., when perfect stillness reigned up to about 2 p. m. After that the wind blew from the south, sometimes with tremendous velocity until 7 p. m., after which it slackened gradually. The loss of property in this district was considerable, but no lives were lost. The timely advice was very valuable to the inhabitants.

Ponce.—Hurricane order 11 a. m., 7th, came to hand on Playa of Ponce at 5 p. m. It was immediately posted in the most public place, advised numerous persons thereof, and also on that afternoon personally informed by writing the different vessels in port of the probable approach of the hurricane, and gave them the text of your telegram. The owners of boats, lighters, etc., availed themselves thereof in order to place craft out of all possible danger. I have been told of persons in the "pueblo" who availed themselves of the notice to place their families out of harm's way. The two flags, one above the other, were hoisted and kept flying during the hurricane until flood and heavy breakers from the sea washed the pole down.

Arroya.—Order to hoist hurricane signal received 3 p. m. of the 7th, and signals were immediately hoisted. The Spanish steamship *Alava*, 1,445 tons, left the harbor at once to take refuge in the Port of Jobos, and was followed by the schooner *Guillermito*, sloop *Maria Artan*, and British schooner *Brudenell*. All lighters and boats in the harbor were put out in places of supposed safety. At 5:30 a. m., 8th, barometer, 29.30, the hurricane began with such force that, not having instruments to gage the wind, I can only estimate to have been over 100 miles an hour. The barometer fell rapidly until 8 a. m., when it read 27.90, the wind blowing from the north all the time until about 8:30, when there was a lull of about one-quarter to a half hour, when the wind changed and came upon us with such terrific force from the south that it appeared that nothing could stand against it. As regards the damage and destruction it is so enormous that it is difficult to make an estimate. A very conservative estimate of the actual losses of the districts of Guayama, Arroya, Patillas, and Maunabo can be safely placed at $1,000,000. Your advice was of great service to the shipping, as, although the coasters that went to Jobos were driven ashore on the mangrove swamps and also the schooner *Brudenell*, the steamship *Alava* was saved. The captain of the *Alava* states that with all anchors down and machinery working full speed ahead, he dragged for half a mile, went on a mud bank, and stuck there twelve hours. Owing to the timely warning no lives were lost among the shipping. All minor crops were completely lost.

Arecibo.—Hurricane signals were hoisted upon the receipt of telegram at 2 p. m., 7th. The authorities were notified and the news was spread as much as possible among the people. The flood of the three rivers, which by a common mouth, empty into the sea near this town, was such an enormous one that old people here have no recollection of anything to equal it. The loss of life and property is beyond an approximate estimate at the present time. Some give the number of the drowned and killed at 500 more or less, while others place the figure as being nearly 1,000. Almost all the peasantry houses and

huts in the plains, and higher up on the river sides, have been carried to sea or destroyed, while in the lower part of this town, which was several meters under water, the loss of property was immense, and most of the poor people were deprived of shelter. Crops sustained damage amounting to many hundred thousand dollars. The dam of the aqueduct, situated on the hills, broke, carrying away everything in its path. Thousands of cattle from the pasture lands in which the district abounded, as well as stock from the estates, has disappeared into the sea. Railroads and bridges were destroyed and ruin and desolation reign supreme.

Fajardo.—The flags were not hoisted, as I was out of the city, but the warnings prevented damage of importance, as word was immediately sent to all plantations to prepare for an emergency. Two schooners in port took convenient positions and were saved. One of them was to sail on that day, and the warning kept her from sailing. No lives were lost in this district, but the damage to property was material and crops were ruined. I can say that good service was rendered by the Weather Bureau on this occasion.

Humacao.—The signal was hoisted and was well justified. The hardest wind came from the southeast, very little from the south. The estimated loss of property is $1,000,000; loss of life nearly eighty, though the count is not accurately kept, as many of the dead were buried in the place where the loss of life occurred. A schooner was warned and cleared for Jobos. A tidal wave came in and destroyed almost all houses in this port. A large vessel, the *Monroe*, of New York, was driven ashore. The display was of little benefit, because during the last twenty-three years we have been warned of storms that never arrived, and the people believed this would be the case this year. It also happens that this hurricane was the strongest we have ever had, and all precautions would have been useless.

Santo Domingo, West Indies, Louis Dorman, Observer, Weather Bureau:

Ample warning of the approach of the hurricane was received here, the flags being hoisted at 5 p. m., August 7, while the storm was not felt here until 5 a. m., August 9. Four schooners, two Dominican men-of-war, and the U. S. S. *New Orleans* were anchored off Santo Domingo. The schooners were towed into the river, a safe harbor; the Dominican men-of-war sailed for Cardenas, a safe refuge harbor, 30 miles southwest of here, and Captain Longnecker, of the *New Orleans*, finding that his ship drew too much water to enter here, took a southerly course after having been notified by this office of the probable track of the storm. The observer also sent a message to the Commander of the U. S. S. *Machias*, then anchored off Macoris, 40 miles east of here, and he also took a southward course. The displaymen at Macoris, Sanchez, Samana, Puerto Plata, and Monte Christo were promptly notified by telegraph to hoist signals immediately. The S. S. *American Carib*, of the Clyde Line, which arrived at Macoris the evening of the 7th, was also warned by the display of the storm flags, and, after receiving further information from the displaymen, also sailed southward. The information regarding the storm was thoroughly distributed in the city during the afternoon and evening of the 7th, and, owing to the precautions taken, no casualties occurred and no vessels were lost. It is believed that the northeast coast of the island suffered more than the southern. The greatest wind velocity recorded here was 35 miles an hour, from the south, at 3:45 p. m. of the 9th.

The storm was accompanied by excessive rains, both in the interior and on the coast. The Ozama River rose very high, causing a freshet, during which one-half of the iron bridge spanning the river in this city was carried away. Much damage was caused in the San Christobal district along the banks of the Heina River, 30 miles northeast of here. Many houses were washed away by the overflow of the river, but no particulars can as yet be obtained. The entire city is loud in its praises of the timely warning of the hurricane.

Nassau, Bahamas, Thomas J. McLain, United States Consul:

The storm began at Nassau about 4 p. m. on Friday, the 11th, and ended late in the afternoon of Saturday.

Warning of its approach had been given per cable of the Weather Bureau at Washington, so that the storm was expected and preparations were made for its arrival, which lessened the amount of damage done very materially.

The wind commenced from the northeast and hauled gradually around to the south, the center of the storm passing about 30 miles west of New Providence. The velocity of the wind at one time reached 90 miles an hour and the barometer registered at its lowest 29.10 inches.

The hurricane was the same that swept over Porto Rico and traversed these islands from southeast to northwest. It struck six or eight islands, doing at all of them great damage in the way of blowing down or unroofing houses, destroying crops, uprooting fruit orchards, and wrecking or injuring vessels. The loss of life has been considerable, and further advices from the more distant islands are awaited with much anxiety. In this island the loss is quite severe. There were about fifty vessels in port, mostly small fishing and sponging craft, at least one-half of which were torn from their moorings and dashed against the rocky shores of the islands or were sunken at their anchorages. The only American vessel in port was the S. S. *Cocoa*, of St. Augustine, which moved high up the harbor, kept up steam, and rode out the gale in safety. The British S. S. *Richmond*, belonging to the Imperial Light-House Service, was also in port and escaped injury. The steam tug *Nassau*, formerly tender for Ward's New York and Cuba Line of steamers, broke her moorings, drifted down the harbor, and was wrecked on the reefs west of the city. Two steam yachts drifted over the bar out to sea and have not been heard of since.

On shore the damage was considerable. A large fruit-preserving factory, a big sponge warehouse, a music hall, a dancing pavilion, and about one hundred smaller buildings being blown down. Some damage was done to the roofs of the public buildings, and the contents of the Government House were damaged by water. A general look of desolation and destruction pervaded the entire city. It is already known that at least one hundred lives were lost, mostly fishermen and spongers, and it is expected that the number will be increased when news comes from the outlying islands.

Vigorous steps have already been taken by the colonial authorities to relieve the suffering caused in this vicinity among the poor.

The only disaster to American shipping thus far reported is that of the S. S. *Winifred*, of New York, bound from New York to New Orleans with a general cargo, which was towed into this port on the 18th instant with a loss of funnel and many other damages. She will in all probability be towed to her destination, as proper repairs can not be made here.

P. H. Burns, Superintendent of Bahamas Cable, Nassau:

The scattered position of our islands, slow means of communication, and a tendency to exaggerate make it difficult to obtain accurate information. The following data, though not strictly accurate, may be as close as we can ever get to it.

Number of small craft lost, 50. A few of these, including two steam launches, were swept out of Nassau harbor by the east wind; others were lost on Exuma Cays, some on Berry islands, but a majority on the sponge beds on both sides of Andros Island. The value of these craft was about $50,000. The damage to house property in Nassau was about $5,000. Estimated saving in Nassau harbor by timely warnings about $7,500. The other islands can get no warnings except from the barometer, which, in this storm fell very slowly and gave but slight warning. The center of the storm passed between Nassau and Green Cay, a point 60 miles south, striking the settlement of Red Bays on Andros Island. Northeast wind did some damage there, backed to northwest, and fell dead calm. People came out to gather their scattered effects when the wind came from the southwest with great force, bringing in heavy seas which caused great damage. The storm was severe at Bimini, where a few houses were destroyed. At Grand Bahama the storm was stronger than at Bimini and a few lives were lost. Conservative estimates place the total loss of life at 125, probably 100 occurring at Red Bays. A few sponge vessels are missing which may swell the totals given.

Jupiter, Fla., J. W. Cronk, Observer, Weather Bureau:

The most notable feature connected with the approach of this hurricane was the almost total lack of the so-called usual premonitory signs. The sky took on no brilliant or brickdust colored hues, and did not bank up with masses of threatening clouds. The sea remained light up to the time of the increase of wind with but little swell, and no moaning sounds. The tide was not high, and there was but little thunder and lightning during the passage of the storm. Without warning from the Central Office, or other telegraphic information, the storm would have found this section almost totally unprepared, and, as a consequence, it would have been particularly destructive to life and property.

On the 10th, Nassau, New Providence, Bahamas, was given, as directed by the Central Office, advisory message as to probable visitation of hurricane, in response to a request of the Governor of the Bahamas for information; all other information received was also given Nassau.

Not until the 12th was the approach of the hurricane toward Jupiter indicated by falling barometer, increasing wind, and rising sea and tide at that station, although the entire population was on the alert owing to the hurricane warnings issued on the 11th. The wind increased to high in the early morning and to a gale by midnight, with maximum velocity, on this date, 41 miles from the northeast, at 10:45 p. m. In the early morning of the 13th the hurricane struck Jupiter with great force and continued blowing a gale during the day, with wind shifting to north, northwest, west, and southwest; maximum velocity 52 miles an hour from the north at 6:20 a. m. with an extreme velocity of 63 miles. At 11:30 a. m. 51 miles an hour was registered. Heavy rain fell in the morning and light rain in the afternoon. The barometer fell rapidly until shortly before 8 a. m., and then remained nearly stationary until shortly before noon, when it began to rise steadily. At 8 a. m. the barometer read 29.22, which was within .04 of the lowest recorded reading at this station. All telegraph lines went down, and no telegraphic communication was to be had until the afternoon of the 14th.

Never in the observers experience were more timely or better warnings given the public, and great praise is freely tendered the Weather Bureau for its work. The benefits derived have to be roughly estimated, but the value of property saved by the warnings in the coast section between Titusville and Miami will reach $30,000, or more, principally in boats of small size. Property that it was impracticable to protect to the value of about $5,000 was destroyed in this section. No lives are known to have been lost.

Charleston, S. C., L. N. Jesunofsky, Observer, Weather Bureau:

Not a casualty occurred along the coast of South Carolina during the passage of the hurricane center at close range on the 15th and 16th, which may be attributed to the timely hoists of the hurricane signal, which caused vessels to seek safe harborage. Fortunately the storm tides along the coast reached only 2.8 feet above normal, and the rice and sea-island cotton crops escaped injury. Much rice would have been spoiled if timely warnings had not been given.

All available means were taken to disseminate the hurricane warnings, and it can be safely said that they were the most successful warnings of the year, in that the time which elapsed between the hoist and the beginning of the gale gave mariners and business interests along the south Atlantic coast more than ample time in which to prepare for the dreaded visitor.

Nine steamers, 3 barks, 4 brigs, 26 schooners, and many smaller craft were detained in port; the crews and passengers numbered 319, and the vessels and cargoes were valued at $2,110,000.

Hatteras, N. C., S. L. Dosher, Observer, Weather Bureau:

The wind began blowing a gale from the east the morning of the 16th, varying in velocity from 36 to 50 miles an hour, and gradually shifting to northeast by 6 p. m., with nearly stationary pressure. During the early morning of the 17th the wind increased to a hurricane and at 4 a. m. was blowing at the rate of 70 miles an hour; 10 a. m. it had increased to 84 miles; and at 1 p. m. it was blowing 93 miles an hour, with occasional extreme velocity of 120 to 140 miles an hour. The record of wind after about 1 p. m. was lost, but it is estimated that it blew with even greater force from about 3 p. m. to 7 p. m., and it is believed that between these hours the wind reached a regular velocity of at least 100 miles an hour. The barometer began to fall rapidly about 8 a. m. of the 17th, and 8 p. m. of that date it had reached the unprecedentedly low reading of 28.620 inches, where it remained about an hour, when it began to rise rapidly, and by midnight it had risen nearly one-half inch. From 7:30 to 8 p. m. of the 17th there was a lull in the gale when it veered to southeast and begun to blow at an estimated velocity of 60 to 70 miles, which continued until well into the morning of the 18th.

This hurricane was the most severe in the history of Hatteras. The scene on the 17th was wild and terrific. By 8 a. m. the entire island was covered by water from the Sound, and by 11 a. m. all the land was covered to a depth of from 4 to 10 feet. This tide swept over the island at a fearful rate carrying everything movable before it. There were not more than four houses on the island in which the tide did not rise to a depth of 1 to 4 feet, at least half the people had to abandon their homes and seek safety with those who were fortunate enough to live on the higher grounds. The frightened people were crowded 40 or 50 in a house. All this day the gale, the tide, and the sea continued with unabated fury. During the lull in the evening the tide ran off with great swiftness, causing a fall in the water of several feet in less than half and hour. Domestic stock was drowned, and it is believed that the property loss to Hatteras alone will amount to $15,000 or $20,000. The fishing industry has, for a time, been swept out of existence, and of the 13 fish-packing houses, which were situated on the water front, 10 with all their equipments and contents were lost. A great proportion of the houses on the island were badly damaged and many families are without homes. All bridges are swept away and roadways are piled high with wreckage. All telegraph and telephone lines are down.

The following vessels are known to be lost between Hatteras and Big Kinnakeet:

A large steamship foundered about one mile off Hatteras beach the night of the 17th, and it is thought all on board were drowned. From the marks on some of the wreckage which drifted ashore it is supposed her name was the *Agnes* and that she was German or Norwegian. She was loaded with cotton and staves, a portion of which cargo drifted on the beach. The Diamond Shoals Light-Ship which was stationed off Hatteras broke loose from her moorings the morning of the 17th and was carried southward by the gale; when the wind shifted to the southeast she was carried ashore near Creeds Hill Life-Saving Station, where she now lies high on the beach. The crew was saved by the Creeds Hill life-saving crew. The three-masted schooner *Florence Randall* went ashore 1 mile north of Big Kinnakeet Life-Saving Station the night of the 16th. The crew was saved by the Kinnakeet life-saving crew. The schooner will be a total loss. The damage to the instruments and property of the Weather Bureau office was considerable, the anemometer being carried away before the storm attained its maximum strength, and the rain gage was swept away the early morning of the 17th.

The people of this locality had ample warning of this storm, yet such preparations as could be made were of little avail in a storm of this character. All of the stores, warehouses, and other buildings in which property is stored for safe keeping are situated along the water front, and in this case they were either flooded or swept away. No lives were lost at Hatteras, although there were many narrow escapes. At Ocracoke and Portsmouth, 16 and 20 miles south of this station, the storm was about as severe as at Hatteras; reliable details are, however, lacking.

The foregoing reports show that maritime and commercial interests have been lavish in commendatory utterances regarding the value of the Weather Bureau warnings and advices issued in connection with this hurricane. The Bureau of Navigation, United States Navy Department, has acknowledged the prompt and valuable telephone and telegraphic notices of the hurricane, whereby action calculated to provide against damage or disaster to vessels of the United States Navy could be taken, and the press of the United States and the West Indies has given full credit for the accurate and invaluable forecasts and reports that were furnished for the information and benefit of the public.

THE CARABELLE, FLA., STORM OF AUGUST 1-2, 1899.

The following is the substance of a report by Mr. A. J. Mitchell, Observer and Section Director, Weather Bureau, on a storm which visited a small part of western Florida on the 1st and 2d of August, 1899:

At Carabelle, Fla., over which the center of the storm doubtless passed, the wind was fresh to brisk from the northeast on July 31, and increased gradually until sunrise of August 1, when the gale was furious. About noon of the same day almost a calm prevailed. Within a short time the wind increased to a furious gale from the west, which continued until nearly sundown, the wind gradually diminishing with a west backing to south direction. At 3 a. m. of the 2d a severe thunderstorm with torrential rain, occurred.

The diameter of the storm was not more than 40 miles, and its force was spent before it progressed 50 miles inland.

Great damage befell the town of Carabelle, where not more than a score of unimportant houses withstood the storm. The result to shipping was disastrous. The following vessels, most of them loaded, were wrecked: 14 barks, 40 small boats under twenty tons, and 3 pilot boats. The value of the vessels and cargoes lost was $375,000. Carabelle was damaged to the extent of $100,000, other towns to the extent of $50,000, and crops were destroyed to the value of $50,000. The number of persons drowned and killed was 6.

This storm was purely local in character, and could not, therefore, be made the subject of a specific forecast. The weather conditions were somewhat threatening July 30 and 31, and on the 30th an advisory message, stating the likelihood of strong winds, was sent to all stations on the Florida Peninsula. The displayman at Cedar Keys, Fla., reports that "40 vessels, coasting schooners, and spongers were detained in port by the warning, and but for this information of the storm they would have sailed and some would have been lost."

RIVERS AND FLOODS.

River matters were entirely uneventful during the month of August, 1899. The period of the year at which the lowest stages of water are to be expected was rapidly approaching, and the rivers, as a rule, fell steadily throughout the month, the minimum stages being generally reached on the last day. The only exceptions occurred in the Atlantic States, where heavy local showers caused a temporary suspension of the fall during the last few days of the month.

The highest and lowest water, mean stage, and monthly range at 125 river stations are given in the accompanying table. Hydrographs for typical points on seven principal rivers are shown on the accompanying chart. The stations selected for charting are: Keokuk, St. Louis, Cairo, Memphis, Vicksburg, and New Orleans on the Mississippi; Cincinnati,

on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, Forecast Official.*

Heights of rivers referred to zeros of gages, July, 1899.

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Mississippi River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
St. Paul, Minn	1,957	14	8.8	26	3.5	6-9	5.2	5.3
Reads Landing, Minn	1,887	12	4.4	31	1.2	18	2.2	3.2
La Crosse, Wis	1,822	12	5.2	31	2.6	18, 19	3.4	2.6
North McGregor, Iowa	1,762	18	3.8	4, 5	2.1	20	2.9	1.7
Dubuque, Iowa	1,702	15	3.9	5	2.2	21, 22	3.0	1.7
Leclaire, Iowa	1,612	10	2.3	6	1.2	23-26	1.7	1.1
Davenport, Iowa	1,596	15	3.3	6	2.0	23-25	2.6	1.3
Muscatine, Iowa	1,565	16	4.2	8, 10	2.6	24-26	3.4	1.6
Galland, Iowa	1,475	8	1.8	1, 2, 9	0.9	28	1.4	0.9
Keokuk, Iowa	1,466	14	3.1	1	1.2	26-29	2.1	1.9
Hannibal, Mo	1,405	17	7.3	9	2.4	29-31	3.8	4.9
Grafton, Ill	1,307	23	9.9	11	3.3	31	5.6	6.6
St. Louis, Mo	1,264	30	16.2	11	7.3	31	12.0	8.9
Chester, Ill	1,189	36	12.1	12	5.3	31	9.1	6.8
Memphis, Tenn	843	33	11.6	1	5.7	31	9.6	5.9
Helena, Ark	767	42	17.7	1	9.8	31	15.0	7.9
Arkansas City, Ark	635	42	22.0	1	10.8	31	16.5	11.2
Greenville, Miss	595	42	18.1	1	9.1	31	13.6	9.0
Vicksburg, Miss	474	45	20.7	1	10.3	31	15.4	10.4
New Orleans, La	108	16	5.9	1	4.1	20, 21	5.0	1.8
Missouri River.								
Bismarck, N. Dak	1,201	14	6.6	1	3.8	31	5.3	2.8
Pierre, S. Dak	1,006	14	7.1	1	4.4	30, 31	5.6	2.7
Sioux City, Iowa	676	19	10.7	1	7.6	31	9.0	3.1
Omaha, Nebr	561	18	11.0	1	8.5	31	9.5	2.5
St. Joseph, Mo	373	10	7.2	6	4.6	31	6.2	2.6
Kansas City, Mo	280	21	16.1	1	10.4	31	13.2	5.7
Boonville, Mo	191	20	13.7	1	9.3	27, 28	11.6	4.4
Hermann, Mo	95	24	12.9	1, 2	8.7	29, 30	11.1	4.2
Des Moines River.								
Des Moines, Iowa	150	19	3.9	5-10	2.9	31	3.6	1.0
Illinois River.								
Peoria, Ill	135	14	4.4	2	3.4	22-24, 27-29	3.8	1.0
Youghiogheny River.								
Confluence, Pa	59	10	4.0	5	0.4	26	1.2	3.6
West Newton, Pa	15	23	3.9	5	0.0	24-26	0.7	3.9
Allegheny River.								
Warren, Pa	177	7	0.3	1	0.0	13-31	0.1	0.3
Oil City, Pa	123	13	0.8	1	−0.1	29-31	0.2	0.9
Parkers Landing, Pa	73	20	1.4	13	−0.2	21, 22	0.6	1.6
Monongahela River.								
Weston, W. Va	161	18	0.0	12	−1.4	24-27	−0.8	1.4
Fairmont, W. Va	119	25	2.2	7	0.2	19-27	0.7	2.0
Greensboro, Pa	81	18	8.3	1	6.2	25-30	6.7	2.1
Lock No. 4, Pa	40	28	10.6	1	5.6	26	7.5	5.0
Conemaugh River.								
Johnstown, Pa	64	7	2.8	28	0.7	26	1.5	2.1
Red Bank Creek.								
Brookville, Pa	35	8	0.6	4, 5	−0.2	30, 31	0.3	0.8
Beaver River.								
Ellwood Junction, Pa	10	14	0.3	12, 13	−0.3	1-4	−0.1	0.(
Great Kanawha River.								
Charleston, W. Va	61	30	7.0	6	6.3	8	6.7	0.7
New River.								
Hinton, W. Va	95	14	1.8	2	1.0	25-29	1.4	0.8
Cheat River.								
Rowlesburg, W. Va	36	14	2.8	1	−0.8	26	0.5	3.6
Ohio River.								
Pittsburg, Pa	966	22	6.4	27	4.9	3	5.6	1.5
Davis Island Dam, Pa	960	25	5.5	6	1.8	25, 26	3.1	3.7
Wheeling, W. Va	875	36	6.2	7	1.3	27	3.2	4.9
Parkersburg, W. Va	785	36	7.0	8, 9	1.9	29	4.5	5.1
Point Pleasant, W. Va	703	39	7.8	3	1.7	29-31	3.8	6.1
Catlettsburg, Ky	651	50	10.1	4	1.6	31	4.9	8.5
Portsmouth, Ohio	612	50	10.3	5	2.4	31	6.0	7.9
Cincinnati, Ohio	499	50	13.5	11	4.0	30, 31	8.0	9.5
Louisville, Ky	367	28	7.0	12	2.8	31	4.8	4.2
Evansville, Ind	184	35	10.9	15	3.8	31	6.8	7.1
Paducah, Ky	47	40	7.6	17	2.3	31	5.3	5.3
Cairo, Ill	1,073	45	17.6	14, 15	8.0	31	14.2	9.6
Muskingum River.								
Zanesville, Ohio	70	20	8.0	6	5.7	17, 24-27, 29-31	6.1	2.3
Miami River.								
Dayton, Ohio	69	18	1.3	6	0.6	25, 26	0.9	0.7
Wabash River.								
Mount Carmel, Ill	50	15	4.0	12-13	0.9	30, 31	2.2	3.4
Licking River.								
Falmouth, Ky	30	25	4.3	12	0.4	31	1.2	3.6
Clinch River.								
Speers Ferry, Va	156	20	1.2	1	−0.6	26, 27	0.1	1.8
Clinton, Tenn	46	25	5.0	6	3.0	31	4.1	2.0
Tennessee River.								
Knoxville, Tenn	614	28	0.4	1	−1.2	28, 29	−0.4	1.6
Kingston, Tenn	534	25	1.3	1	0.3	21-23	0.5	1.0
Chattanooga, Tenn	430	33	4.4	1	1.2	25-28	2.1	3.2
Bridgeport, Ala	390	24	3.2	1	0.2	31	1.0	3.0

Heights of rivers referred to zeros of gages—Continued.

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Tennessee River—Con.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Florence, Ala	220	16	2.6	3	0.1	31	0.9	2.5
Riverton, Ala	190	25	2.7	3	−1.4	31	0.2	4.1
Johnsonville, Tenn	94	21	3.7	5	0.7	31	2.0	3.0
Cumberland River.								
Burnside, Ky	434	50	3.0	15	0.3	31	1.2	2.7
Carthage, Tenn	257	30	3.0	1	0.6	30	1.6	2.4
Nashville, Tenn	175	40	5.4	1	1.5	27, 30, 31	2.7	3.9
Arkansas River.								
Wichita, Kans	720	10	4.9	12	1.6	31	2.8	3.3
Webbers Falls, Ind. T	407	23	5.1	18	1.8	31	3.2	3.3
Fort Smith, Ark	345	22	7.0	1	3.1	31	5.0	3.9
Dardanelle, Ark	250	21	6.8	1	2.5	31	3.7	4.3
Little Rock, Ark	170	23	8.9	1	3.9	31	5.4	5.0
White River.								
Newport, Ark	150	26	4.5	1	1.5	26, 27	2.5	3.0
Yazoo River.								
Yazoo City, Miss	80	25	7.0	3, 4	0.0	17, 18	2.7	7.0
Red River.								
Arthur City, Tex	688	27	10.5	1	6.1	30, 31	7.4	4.4
Fulton, Ark	565	28	15.7	1	3.9	31	6.4	11.8
Shreveport, La	449	29	11.9	1	2.0	31	5.9	9.9
Alexandria, La	139	33	9.5	1	0.9	31	4.9	8.6
Ouachita River.								
Camden, Ark	340	39	4.0	1	2.7	29	3.2	1.3
Monroe, La	100	40	3.0	1	0.6	30, 31	1.4	2.4
Atchafalaya Bayou.								
Melville, La	100*	31	21.1	2	11.7	31	16.3	9.4
Susquehanna River.								
Wilkesbarre, Pa	178	14	1.5	7	−1.8	21	−0.5	3.3
Harrisburg, Pa	70	17	4.0	28	0.4	26	1.0	3.6
W. Br. of Susquehanna.								
Williamsport, Pa	35	20	2.5	28	0.0	7, 8, 21	0.5	2.5
Juniata River.								
Huntingdon, Pa	80	24	4.2	29	2.8	26, 27	3.0	1.4
Potomac River.								
Harpers Ferry, W. Va	170	16	2.1	29	0.8	1-3	1.4	1.3
James River.								
Lynchburg, Va	257	18	1.2	15	−0.1	24-26	0.3	1.3
Richmond, Va	110	12	1.6	28	−2.6	3	−0.8	4.2
Roanoke River.								
Clarksville, Va	155	12	4.6	29	0.8	26, 27	2.4	3.8
Weldon, N. C	90	40	13.4	29	7.2	28	8.8	6.2
Cape Fear River.								
Fayetteville, N. C	100	38	11.5	1	1.5	30	4.4	10.0
Lumber River.								
Fairbluff, N. C	10	6	6.0	1	0.8	31	3.7	5.2
Edisto River.								
Edisto, S. C	75	6	4.1	31	1.5	26	2.8	2.6
Pedee River.								
Cheraw, S. C	145	27	5.3	2	0.8	29	1.9	4.5
Black River.								
Kingstree, S. C	60	12	1.1	31	0.5	21-28	0.7	0.6
Lynch Creek.								
Effingham, S. C	35	12	4.3	2	1.4	26	2.4	2.9
Santee River.								
St. Stephens, S. C	50	12	5.9	1	−0.4	24, 25	1.7	6.3
Congaree River.								
Columbia, S. C	37	15	2.2	29	−0.2	6	0.4	2.4
Wateree River.								
Camden, S. C	45	24	7.1	31	2.9	22, 27	4.2	4.2
Waccamaw River.								
Conway, S. C	40	7	6.9	15, 16	4.2	29	5.9	2.7
Savannah River.								
Calhoun Falls, S. C	......	......	3.5	30	2.5	19, 20	2.8	1.0
Augusta, Ga	130	32	13.2	28	4.7	22	6.6	8.5
Broad River.								
Carlton, Ga	......	......	4.1	31	1.9	17-20, 22, 24	2.2	2.2
Flint River.								
Albany, Ga	80	20	4.9	3, 4	0.2	30, 31	2.0	4.7
Chattahoochee River.								
Oakdale	......	......	5.2	27	0.1	25, 26	1.9	5.1
West Point, Ga	239	20	4.1	30	1.9	25	2.7	2.2
Coosa River.								
Rome, Ga	225	30	2.5	27-29, 31	0.7	24-26	1.5	1.8
Gadsden, Ala	144	18	3.4	1	−0.2	16, 17, 26	0.6	3.6
Alabama River.								
Montgomery, Ala	265	35	9.4	1	1.3	16	2.9	8.1
Selma, Ala	212	35	11.1	1	2.6	15-17	4.5	8.5
Tombigbee River.								
Columbus, Miss	285	33	−0.4	1	−2.7	16, 25, 26	−2.0	2.3
Demopolis, Ala	155	35	7.7	1	−0.9	16	0.8	8.6
Black Warrior River.								
Tuscaloosa, Ala	90	38	6.5	1	0.3	17, 18	1.8	6.2
Columbia River.								
Umatilla, Oreg	270	25	16.3	1	9.4	31	12.1	6.9
The Dalles, Oreg	166	40	26.7	1	14.6	31	19.3	12.1
Willamette River.								
Albany, Oreg	99	20	3.0	28, 29	1.8	9-18	2.1	1.2
Portland, Oreg	10	15	15.0	1	7.3	31	10.2	7.7
Sacramento River.								
Red Bluff, Cal	241	23	−0.8	1-24	−0.9	25-31	−0.8	0.1
Sacramento, Cal	70	25	8.5	1-4	7.8	27-31	8.1	0.7

*Distance to Gulf of Mexico.

CLIMATE AND CROP SERVICE.

By JAMES BERRY, Chief of Climate and Crop Service Division.

The following extracts relating to the general weather conditions in the several States and Territories are taken from the monthly reports of the respective sections of the Climate and Crop Service. The name of the section director is given after each summary.

Rainfall is expressed in inches.

Alabama.—The mean temperature was 81.3°, or 2.2° above normal; the highest was 103°, at Riverton on the 12th, and the lowest, 58°, at Opelika on the 30th. The average precipitation was 3.68, or 1.14 below normal; the greatest monthly amount, 8.55, occurred at Newton, and the least, 0.70, at Florence.—*F. P. Chaffee.*

Arizona.—The mean temperature was 80.7°, or 2.2° below normal; the highest was 118°, at Fort Mohave on the 31st, and the lowest, 34°, at Flagstaff on the 23d. The average precipitation was 1.26, or 0.85 below normal; the greatest monthly amount, 5.77, occurred at Fort Huachuca, while none fell at several stations.—*W. G. Burns.*

Arkansas.—The mean temperature was 82.2°, or 3.6° above normal; the highest was 112°, at Conway on the 12th and 23d, and the lowest, 54°, at Rison on the 12th. The average precipitation was 2.04, or 1.13 below normal, the greatest monthly amount, 6.45, occurred at Lacrosse, and the least, 0.07, at Spielerville—*E. B. Richards.*

California.—The mean temperature for the State, obtained by weighting the reports from 287 stations, so that equal areas have about the same weight, was 70.8°, or 5.1° below the August normal for the State, as determined from 200 records; the highest was 120°, at Volcano Springs on the 31st, and the lowest, 20°, at Bodie on the 22d and 23d. The average precipitation for the State, as determined by the records of 302 stations, was 0.11; the excess, as indicated by reports from 209 stations which have normals, was 0.05; the greatest monthly amount, 1.75, occurred at Fordyce Dam, while none fell at many stations.—*Alexander G. McAdie.*

Colorado.—The mean temperature was 66.3°, or 0.5° below normal; the highest was 106°, at Lamar on the 26th and 27th, and the lowest, 20°, at Troutvale on the 20th. The average precipitation was 1.56, or about normal; the greatest monthly amount, 3.98, occurred at Smoky Hill Mine, and the least, 0.18, at Ruby.—*F. H. Brandenburg.*

Florida.—The mean temperature was 82.2°, or 1.2° above normal; the highest was 102°, at De Funiak Springs on the 6th, and the lowest, 62°, at Fort Meade on the 1st, 6th, 8th, and 10th. The average precipitation was 6.62, or about normal; the greatest monthly amount, 11.80, occurred at De Funiak Springs, and the least, 2.02, at Tarpon Springs.—*A. J. Mitchell.*

Georgia.—The mean temperature was 81.1°, or 2.2 above normal; the highest was 105°, at Fleming on the 6th and 7th and at Covington on the 21st and 22d; the lowest was 57°, at Millen on the 18th. The average precipitation was 4.58, or 1.02 below normal; the greatest monthly amount, 12.00, occurred at Crescent, and the least, 1.17, at Eastman.—*J. B. Marbury.*

Idaho.—The mean temperature was 61.1°, or 6.3° below normal; the highest was 111°, at Hagerman on the 2d, and the lowest, 19°, at Chesterfield and Downey on the 22d. The average precipitation was 1.17, or 0.68 above normal; the greatest monthly amount, 3.61, occurred at Murray, and the least, trace, at Blackfoot and Oakley.—*S. M. Blandford.*

Illinois.—The mean temperature was 76.3°, or 2.6 above normal; the highest was 102°, at Bloomington on the 27th, and the lowest, 44°, at Lanark and Savanna on the 16th. The average precipitation was 2.57, or 0.19 below normal; the greatest monthly amount, 7.49, occurred at Hillsboro, and the least, 0.57, at Danville.—*C. E. Linney.*

Indiana.—The mean temperature was 76.1°, or 3.7 above normal; the highest was 102°, at Princeton on the 2d, and the lowest, 49°, at Laporte on the 16th. The average precipitation was 3.03, or about normal, but badly distributed, an excess occurring in the southern portion and a deficiency in the northern; the greatest monthly amount, 7.68, occurred at Paoli, and the least, trace, at Valparaiso.—*C. F. R. Wappenhans.*

Iowa.—The mean temperature was 74.4°, or 3.3 above normal; the highest was 100°, at Wapello on the 3d, at Bedford on the 9th, and at Clarinda and Hampton on the 23d; the lowest was 41°, at Hampton on the 25th. The average precipitation was 3.68, or 0.61 above normal; the greatest monthly amount, 10.45, occurred at Thurman, and the least, 1.12, at Algona.—*J. R Sage, Director; G. M. Chappel, Assistant.*

Kansas.—The mean temperature was 80.6°; or 4.2° above normal, and the warmest August on record; the highest was 109°, at Englewood on the 11th, and at Medicine Lodge on the 19th, and the lowest, 42°, at Achilles on the 14th. The average precipitation was 2.09, or 0.79 below normal; the greatest monthly amount, 6.39, occurred at Sedan, and the least, 0.19, at Colby.—*T. B. Jennings.*

Kentucky.—The mean temperature was 78.1°, or 2.4° above normal; the highest was 102°, at Maysville on the 3d and at Paducah on the 11th, and the lowest, 51°, at Catlettsburg on the 1st and at Greensburg on the 8th. The average precipitation was 3.09, or 0.31 below normal, and very unevenly distributed; the greatest monthly amount, 5.83, occurred at Maysville, and the least, 1.26, at Greensburg.—*H. B. Hersey.*

Louisiana.—The mean temperature was 83.3°, or 2.3° above normal; the highest was 108°, at Liberty Hill on the 1st, and the lowest, 60°, at Plaquemine on the 5th and at Cheneyville on the 17th. The average precipitation was 4.55, or 0.83 below normal; the greatest monthly amount, 10.61, occurred at White Sulphur Springs, and the least, 0.61, at Shreveport.—*W. T. Blythe.*

Maryland and Delaware.—The mean temperature was 74.3°, or normal; the highest was 102°, at Sandy Point, Md., on the 5th, and the lowest, 41°, at Grantsville, Md., on the 17th and at Deerpark, Md., on the 23d. The average precipitation was 4.36, or 0.47 above normal; the greatest monthly amount, 7.66, occurred at Millsboro, Del., and the least, 0.75, at Boettcherville, Md.—*F. J. Walz.*

Michigan.—The mean temperature was 69.1°, or 2.7° above normal; the highest was 100°, at Owosso on the 19th and 20th, and the lowest, 30°, at Humboldt on the 7th, at Wetmore on the 13th, at Luzerne on the 15th, and at Newberry and Mancelona on the 23d. The average precipitation was 1.25, or 1.55 below normal; the greatest monthly amount, 5.88, occurred at Humboldt; no precipitation occurred at Allegan and only a trace at Port Austin, Hayes, Carsonville, and Ovid.—*C. F. Schneider.*

Minnesota.—The mean temperature was 69.1°, or about 2.0 above normal; the highest was 102°, at New Ulm on the 10th, and the lowest, 33°, at Hallock on the 13th. The average precipitation was 5.35, or 2.50 above normal; the greatest monthly amount, 11.68, occurred at Morris, and the least, 2.42, at New Folden.—*T. S. Outram.*

Mississippi.—The mean temperature was 82.4°, or 2.3 above normal; the highest was 107°, at Westpoint on the 12th and 23d, and the lowest, 60°, at Hernando on the 27th. The average precipitation was 3.70, or 0.99 below normal; the greatest monthly amount, 8.66, occurred at Windham, and the least, 0.80, at Hazelhurst.—*H. E. Wilkinson.*

Missouri.—The mean temperature was 78.7°, or 3.7° above normal; the highest was 107°, at Appleton City on the 23d, and the lowest, 49°, at Potosi on the 22d. The average precipitation was 3.34, or 0.13 above normal; over portions of the central and northern sections there was a decided excess, while over a large area in the southwestern portion of the State there was a marked deficiency; the greatest monthly amount, 7.33, occurred at Hannibal, and the least, 0.20, at Mineral springs.—*A. E. Hackett.*

Montana.—The mean temperature was 60.0°, or 4.5° below normal; the highest was 98°, at Glendive on the 13th, and at Fort Keogh on the 14th and 21st, and the lowest, 26°, at Ovando on the 29th. The average precipitation was 1.22, or 0.48 above normal; the greatest monthly amount, 3.44, occurred at Columbia Falls, and the least, trace, at Billings.—*E. J. Glass.*

Nebraska.—The mean temperature was 73.8°, or about 1.0° above normal; the highest was 108°, at Camp Clarke on the 28th, and the lowest, 31°, at Kennedy on the 31st. The average precipitation was 3.26, or 0.67 above normal; the greatest monthly amount, 9.78, occurred at Fremont, and the least, 0.10, at Merriman.—*G. A. Loveland.*

Nevada.—The mean temperature was 63.6°, or about 6.4° below normal; the highest was 99°, at Empire Ranch on the 2d, and the lowest, 20°, at Wells on the 20th. The average precipitation was 0.71, or about 0.02 above normal; the greatest monthly amount, 3.10, occurred at Elko, while none fell at Los Vegas and Mill City.—*J. H. Smith.*

New England.—The mean temperature was 67.4°, or 0.3 above normal; the highest was 99°, at Statford, Vt., on the 30th, and the lowest, 32°, at Flagstaff, Me., on the 15th. The average precipitation was 1.94, or 2.26 below normal; the greatest monthly amount, 6.50, occurred at Kingston, R. I., and the least, trace, at Orono, Me.—*J. W. Smith.*

New Jersey.—The mean temperature was 72.3°, or about normal; the highest was 99°, at Salem on the 5th and at Dover on the 21st, and and the lowest, 39°, at Charlotteburg on the 9th. The average precipitation was 4.36, or 0.52 above normal; the greatest monthly amount, 9.70, occurred at Tuckerton, and the least, 2.21, at Freehold.—*E. W. McGann.*

New Mexico.—The mean temperature was 72.8°, or 1.4° above normal; the highest was 109°, at Eddy on the 12th, and the lowest, 28°, at Winsors on the 20th. The average precipitation was 0.89, or 1.53 below normal; the greatest monthly amount, 3.30, occurred at Aztec, while at Clayton there was none recorded, and at Eddy only a trace.—*R. M. Hardinge.*

New York.—The mean temperature was 69.3°, or 2.1° above normal; the highest was 100°, at Nunda on the 20th, and the lowest, 33°, at Straits Corners on the 15th and 16th and at Saranac Lake on the 16th. The average precipitation was 1.88, or 2.10 below normal; the greatest

monthly amount, 5.28, occurred at Plattsburg Barracks, and the least, 0.05, at Mount Morris.—*R. G. Allen.*

North Carolina.—The mean temperature was 77.7°, or 1.7° above normal; the highest was 102°, at Southern Pines on the 3d and at Saxon on the 20th, and the lowest, 47°, at Linnville on the 16th. The average precipitation was 4.18, or 1.60 below normal; the greatest monthly amount, 14.19, occurred at Hatteras, and the least, 0.65, at Soapstone Mount.—*C. F. von Herrmann.*

North Dakota.—The mean temperature was 65.5°, or 0.6° below normal; the highest was 97°, at Medora on the 25th, and the lowest, 32°, at Foxholm and Hamilton on the 13th, Woodbridge on the 29th, and Minto on the 31st. The average precipitation was 2.90, or 1.32 above normal; the greatest monthly amount, 7.80, occurred at Fullerton, and the least, 0.24, at Melville.—*B. H. Bronson.*

Ohio.—The mean temperature was 73.7°, or 2.5 above normal; the highest was 104°, at Warsaw on the 20th, and the lowest, 39°, at Wooster on the 7th. The average precipitation was 1.82, or 1.26 below normal; the greatest monthly amount, 6.26, occurred at New Paris, and the least, 0.15, at Plattsburg.—*J. Warren Smith.*

Oklahoma.—The mean temperature was 85.6°, or 6.2 above normal; the highest was 113°, at Kemp on the 26th, and the lowest, 59°, at Pawhuska and Prudence on the 29th. The average precipitation was 0.87, or 2.29 below normal; the greatest monthly amount, 3.18, occurred at Perry, while none fell at many stations in the south and west.—*J. I. Widmeyer.*

Oregon.—The mean temperature, 60.6°, the lowest on record, was 5.0° below normal; the highest was 97° at Pendleton on the 4th, and the lowest, 16°, at Riverside on the 14th. The average precipitation, 2.42, was 1.84 in excess of the normal, and was the heaviest on record; the greatest monthly amount, 8.13, occurred at Nehalem, and the least, 0.08, at Klamath Falls.—*B. S. Pague.*

Pennsylvania.—The mean temperature was 71.2°, or 1.6° above normal; the highest was 101°, at Huntingdon on the 21st, and the lowest, 33°, at Shingle House on the 9th. The average precipitation was 4.01, or 0.33 above normal; the greatest monthly amount, 10.09, occurred at Carlisle, and the least, 0.07, at Erie.—*T. F. Townsend.*

South Carolina.—The mean temperature was 81.2°, or 2.6° above normal; the highest was 103°, at Batesburg and Beaufort on the 6th, and the lowest, 59°, at Santuc on the 18th. The average precipitation was 6.26, or about normal; the greatest monthly amount, 17.94, occurred at Pinopolis, and the least, 1.33, at Cheraw.—*J. W. Bauer.*

South Dakota.—The mean temperature was 71.4°, or about 1.0° above normal; the highest was 104°, at Interior on the 16th, and the lowest, 30°, at Rochford on the 24th. The average precipitation was 3.55, or about 1.06 above normal; the greatest monthly amount, 9.56, occurred at White Swan, and the least, trace, at Farmingdale.—*S. W. Glenn.*

Tennessee.—The mean temperature was 79.2°, or 3.6° above normal; the highest was 103°, at Covington on the 13th, and the lowest, 51°, at Erasmus on the 19th and at Silverlake on the 24th and 25th. The average precipitation was 2.47, or 1.03 below normal; the greatest monthly amount, 5.68, occurred at Tracy City, and the least, 0.31, at Union City.—*H. C. Bate.*

Texas.—The mean temperature, determined by comparison of 46 stations distributed throughout the State, was 3.1° above the normal; there was a general excess in temperature for the month, ranging from 1.0° to 7.0°, with the greatest over the northwest portion of the State; the highest was 112°, at Mann on the 23d, and the lowest, 56°, at Marathon on the 30th. The average precipitation, determined by comparison of 53 stations distributed throughout the State, was 1.97 below the normal; there was a slight excess in the vicinity of Beaumont and Houston, while there was a general deficiency elsewhere, ranging from 1.00 to 3.33, with the greatest deficit over southwest Texas. The rainfall for August was light and very unevenly distributed over the State. The greatest monthly amount, 5.95, occurred at Jasper, while none fell at many stations over the western half of the State.—*I. M. Cline.*

Utah.—The mean temperature was 65.7°, or 5.2° below normal; the highest was 102°, at St. George on the 31st, and the lowest, 24°, at Croydon on the 23d. The average precipitation was 0.96, or 0.27 above normal; the greatest monthly amount, 2.93, occurred at St. George, while none fell at Terrace. It was the coolest August in Utah of which there is any record.—*L. H. Murdoch.*

Virginia.—The mean temperature was 75.5°, or about 0.5° above normal; the highest was 102°, at Farmville on the 5th, and the lowest, 42°, at Burkes Garden on the 24th. The average precipitation was 4.62, or 0.25 above normal; the greatest monthly amount, 8.81, occurred at Fontella, and the least, 1.39, at Burkes Garden.—*E. A. Evans.*

Washington.—The mean temperature was 60.8°, or about 5.0° below normal; the highest was 100°, at Lind on the 3d, and the lowest, 30°, at Cle-Elum on the 28th. The average precipitation was 2.24, or about three to four times the normal; the greatest monthly amount, 5.77, occurred at Snohomish, and the least, 0.23, at Connell. The month was phenomenally cool and wet, breaking all records of August for low temperature and excessive precipitation.—*G. N. Salisbury.*

West Virginia.—The mean temperature was 73.5°, or 1.2° above normal; the highest was 100°, at New Cumberland on the 20th, and the lowest, 34°, at Terra Alta on the 7th. The average precipitation was 2.64, or 0.92 below normal; the greatest monthly amount, 6.37, occurred at Madison, and the least, 0.34, at Romney.—*C. M. Strong.*

Wisconsin.—The mean temperature was 70.5°, or 2.6 above normal; the highest was 98°, at Brodhead on the 27th, and the lowest, 37°, at Butternut on the 6th. The average precipitation was 3.27, or 0.69 above normal; the greatest monthly amount, 7.40, occurred at Prentice, and the least, 0.36, at Green Bay.—*W. M. Wilson.*

Wyoming.—The mean temperature was 63.0°, or 2.7° below normal; the highest was 101°, at Lovell on the 1st, and the lowest, 20°, at Burns on the 22d and 23d. The average precipitation was 0.82, or 0.06 below normal; the greatest monthly amount, 2.23, occurred at Fort Yellowstone, and the least, trace, at Buffalo.—*W. S. Palmer.*

SPECIAL CONTRIBUTIONS.

WATERSPOUTS AT KEY WEST, FLA.[1]

By H. R. BOYNTON, Observer, Weather Bureau (dated May 26, 1899.)

Seven waterspouts were observed simultaneously, by myself, on the morning of May 26, 1899, at Key West, Fla. They were at an estimated distance of two miles and moving from north to south. Four were well defined and three others plainly outlined. The four fully formed one would sometimes disappear, when others would form and take their places. The procession of whirlwinds moved slowly, thus furnishing an unusually good opportunity for observing the gradual formation of each waterspout. A partially-formed spout would extend downward from the moisture-laden cloud, swing a short distance through space, then be drawn up into the cloud and disappear. This occurred several times; meantime others would reach down from the cloud and descend far enough to form a fully-developed spout connecting with the water below which was already in commotion caused by the influence of the whirling wind. At times the water would rise from below, seemingly outside of the main spout and half way up its trunk. At one time the cross section appeared to form a parallelogram across the main trunk, one-third of the distance from the top, and took the shape of a perfect dagger. The cross-piece had, seemingly, square corners (but a circular ring, observed from a distance, would appear like a parallelogram). This spout, which took the form of a cross, was at first a short spur not more than 3° long, and grew slowly out of the cloud at an angle of 45°. At times it had an undulatory motion. People on vessels in the vicinity say that the water forming up around the base of each column showed forth very brightly the colors of the rainbow. I observed that the sea in the vicinity showed the same characteristics but not so vividly, The cloud above the waterspout was very dark and the sea beneath looked as black as ink. At intervals throughout the forenoon there were whirlwinds in the streets here, of which I saw three at one time.

[1] Waterspouts are so common at stations on the Gulf coast that we can but hope that they may be utilized as a test of the modern thermodynamic theories of the condensation of vapor and formation of clouds. This theory was first put into definite shape by Ferrel in his Recent Advances, but improvement has been made in several points since then by Professor Brillouin of Paris and Prof. F. H. Bigelow of the Weather Bureau. In order to properly study the waterspout we need a series of photographs on a large scale, taken simultaneously from opposite points of view, with the modern photogrammeter, which is simply a camera so mounted as to be movable in altitude and azimuth, with means for accurately determining the direction in which it is pointed at any time. Until such a determined effort has been made to achieve a scientific study of the waterspout (and a similar one of the tornado) we must be content with the general descriptions recorded by careful observers, such as the accompanying from Mr. H. R. Boynton, which is certainly an interesting addition to our knowledge of the waterspout.—ED.

The phenomena differed notably from the description and the cuts usually given in text-books, which describe them as moving swiftly, whereas these moved slowly and vessels in their vicinity were able to avoid them. The books also picture them as tapering to a point at the lower end, but these and others like them were of the same size all the way up. The books represent the spouts as being vertical, but one-third of these had a slant of at least 60°. The one that took the form of a dagger was at first a short spur, not more than 3° long, just peeping out from an overhanging cloud at an angle of 45° and grew quite slowly.

Seven diagrams which are individually reproduced on Plates I and II. The legend at the bottom of each gives many additional particulars so that the student can easily follow the historical order of development in each waterspout.

In addition to the data here given, and in reply to a letter from the Editor, Mr. Boynton sends the following items under date of July 16:

I have a nephoscope and can estimate the field of activity pretty well, and get bearings from the angles of neighboring buildings, and I remember that the waterspouts were at nearly equal distances apart. I also feel confident that I can estimate the height of the columns with quite a degree of accuracy.

Top of columns above bases, 18°.

General width of columns, ½°.

Width of columns at top, where they opened into the cloud, 3°.

Width of columns at base, including water in commotion, 5°.

Distances of columns apart between first and second on the left, 5°; between the others, 4°.

Area of vertically falling water on the right of the field: Altitude, 18°; width, 12°; field of activity, including said area, 40°.

The greater number of the waterspouts were not tapering, like the typical waterspouts, but, except at top and bottom, were of one size all the way up. Therefore, I can not furnish largest diameter, of columns, except at top and base. But there was one notable exception; it was the curved column with a bar across it: Fig. VII.—Spout No. 6. The bar seemed to be 4° long and 1° wide.

Am not able to furnish any account from people aboard ship at the time.

The temperature of the air, etc., can be furnished with perfect accuracy, because the phenomena began just as I began the morning observation: Dry thermometer, 81.0°; wet thermometer, 74.0°; wind, north; wind velocity, 4 miles per hour.

WATER TEMPERATURES OF THE GREAT LAKES.

By NORMAN B. CONGER, Local Forecast Official and Marine Agent.

The study of the distribution of fog on the Great Lakes, which has now been carried on for upward of two seasons, shows among other things the importance of a knowledge of the temperature of the surface water. In 1892, 1893, and 1894 the Weather Bureau collected observations of water temperatures made by masters of vessels plying between Lake ports, and in the last named year the writer was one of a small party that visited Lake Superior and made many surface observations and also a number of observations at depths of 10, 20, and 100 feet. A brief statement of the results of these observations is here given.

Lake Superior.—The lake closes to navigation with the closing of the St. Mary's Canal about December 1, but ice rarely forms in the open lake before the beginning of January. In some of the harbors it does not form much before February 1. Ice on the open lake may form to a thickness of from 1 to 4 feet; it is frequently piled up, however, to a much greater depth. The ice in the open lake breaks up in April and is drifted about by the winds until it finally disappears. The water temperatures in May in shallow bays average about 40°, being slightly warmer at the western end of the lake than along the shore from Marquette eastward. In the middle of the month the average temperature of the water over the great body of the lake is about 37°, being slightly lower in a few localities. In June the temperature of the surface water along shore, where the depth is not great, averages from 48° to 54°, being, as before stated, warmest at the western end of the lake. The temperature is lower toward the deeper parts of the lake, reaching a minimum of 37° in midlake, but the area of 37° is less than during the preceding month. In July the temperature of the surface water in midlake has risen to 40°, while shore temperatures have risen to 60° and over in some of the shallower bays. The difference between the temperature of the water in midlake and along shore is greatest in July and August, viz, 20° and upward. In August the area over which water temperatures of 40° occurs is less than for July and can be found only in the center of the lake. The influence of the warmer air temperatures of June and July is now felt in the general warming up of the waters. Large areas of water show an increase in temperature from the month preceding of about 10°. The maximum temperature of the water in the great body of the lake occurs in September about a month after the highest air temperature. It is to be noticed, however, that the temperature of the water along shore has begun to fall, the maximum of the year being registered in August. During October the temperature of the water falls from 5° to 10° over the great body of the lake. Shore temperatures range from 45° to 50°, decreasing from those amounts to about 40° in deep water. In November the temperature of the water around the shore and in deep bays is about 40°, diminishing to 37° in midlake.

We have thus seen that the surface temperature of the water along shore and in the larger bays increases from 32° in winter to about 60° in August, a total range of 28°. In midlake the increase is very much less, from 32° to 40° or 45°, certainly not more than half of what it is for shore waters.

Lake Michigan.—The observations for the remaining lakes are not sufficiently numerous to discuss the months in detail; our remarks will apply to July only. The coldest portion of Lake Michigan is found in the center of the northern two-thirds where the mean temperature for July is 55° or less, but above 50°. Surrounding this area of relatively cool water is a region of warmer water, 60°, broken only in the northwest where the temperature of the water is about 55°. The temperature of the northeastern part of the lake is between 60° and 65°. The warmest part of the lake, as might be expected, is around the southern end where mean temperatures above 65° may be found.

Masters of vessels occasionally report low water temperatures in summer off the Michigan coast in the vicinity of Grand Haven and Muskegon. Additional observations are required before we are justified in assigning an abnormally cold area to this locality.

Lake Huron.—The observations on this lake are naturally confined to the west shore. The temperature of the water in July is about 65° from near Thunder Bay Island southward to near Port Huron. Colder water may be found in bands extending southeastward from the east and west ends of Drummond Island. The differences between the water temperatures along shore and some distance out in the lake are not so great as in the case of Lake Superior, nor are the differences between water and air temperatures so well marked. In July at Mackinaw the average temperature of water at the surface in a depth of about 11 feet was 63°; the average temperature at the bottom was 62°, while for the same time the average temperature of the air was 69° (average of four years).

In the Detroit River the average surface temperature for July in water 24 feet deep was 69.7°; at the bottom, 69.6°, while the air temperature for the same time was 77.7°, a difference of 8°. Probably the difference between water and air temperatures over Lakes Michigan and Huron is not more than 7°.

Lake Erie.—The temperature of the water in this lake approaches more closely to the temperature of the air than is the case on any other lake. Generally the mean water temperatures range between 70° and 75°.

RECENT PAPERS BEARING ON METEOROLOGY.

W. F. R. PHILLIPS, in charge of Library, etc.

The subjoined list of titles has been selected from the contents of the periodicals and serials recently arrived in the library of the Weather Bureau. The titles selected are of papers or other communications bearing on meteorology or cognate branches of science. This is not a complete index of the meteorological contents of all the journals from which it has been compiled; it shows only the articles that appear to the compiler likely to be of particular interest in connection with the work of the Weather Bureau:

Meteorologische Zeitschrift. Wien. Band 16.

Danckelman, A. Ueber das Harmattanphänomen in Togo. P. 289.

Moller, A. Arbeitsvorgänge bei auf wie absteigenden Luftströmen und die Höhe der Atmosphäre. P. 306.

Polis, P. Ergebnisse der Temperaturbeobachtungen zu Aachen 1838-1897. P. 310.

——— Regenfall am Fusse des Kamerun-Pik. P. 312.

[Hann, J.] Schliessung des Jamaica Weather Service. P. 312.

——— Halo-Phänomen. P. 312.

——— Das kalte Küstenwasser, Entdeckung der Ursache desselben. P. 313.

——— Klima von London. P. 314.

——— Scheitelwerth und Mittelwerth in tropischen Klima. P. 314.

——— Resultate der meteorologischen Beobachtungen in der Depression im Herzen des asiatischen Kontinents, zu Luktschun bei Turfan. P. 315.

Polis, P. Anwendung von meteorologischen Beobachtungen in der medicinishen Klimatologie. P. 317.
——— Der tägliche Gang des Luftdruckes zu Manila, Mauritius, Hong-Kong und Zi-Ka-Wei. P. 319.
[**Hann, J.**] Täglicher Gang des Luftdruckes in Pavia. P. 321.
——— Die Westindia-Cyklone vom September 1898. P. 322.
——— Zur täglichen Periode und Veränderlichkeit der relativen Feuchtigkeit. P. 322.
——— Meteorologische Beobachtungen zu Bismarckburg, Togo-Land. P. 324.
Schwalbe, G. Bemerkung zu meiner Mittheilung über "Die jahrliche Periode der erdmagnetischen Kraft." P. 325.
——— Wolkenformen. P. 325.
——— Klima-Tabelle für Tokio. P. 325.
——— Zur Theorie der allgemeinen Cirkulation der Atmosphäre. P. 327.
——— Jährliche Periode der Gewitter in Norwegen. P. 328.
——— Regenfall in den Bocche di Cattaro und in der Crivoscie.
——— Meteorologische Beobachtungen in New Guinea. P. 330.
Wolfer, A. Provisonische Sonnenflecken-Relativzahlen. P. 331.
Das Wetter. Berlin. 16 Jahrgang.
Bornstein, Prof. Ueber Witterungsdienst. P. 169.
——— MONTHLY WEATHER REVIEW. P. 173.
Clayton, H. H. Elias, H. Ergebnisse der Drachen-Aufstiege vom 24 und 25 November, 1898, am Blue Hill Observatorium. (Fortsetzung). P. 181.
Weise. Wolkenbildung, Regen und Wald. P. 186.
Memorie della Societa degli Spettroscopisti Italiani. Catania. Vol. 28.
Chistoni, Ciro. La formula di Bouger per il calcolo degli spessori atmosferici e della trasparenza dell' aria. P. 133.
Scientific American Supplement. New York.
Lyon, A. B. Climate of the Hawaiian Islands. P. 19,788.
Murry-Aaron, E. West Indian Hurricane. P. 19,804.
Annalen der Physik und Chemie. Leipzig. Band 68.
Bock, A. Der blaue Dampfstrahl. P. 674.
Grutzmacher, Fr. Thermometrische Correctionen. P. 769.
Walter, B. Ueber die Entstehungsweise des elektrischen Funkens. (2 Mittl.) P. 776.
Eschenhagen, M. Werthe der erdmagnetischen Elemente zu Potsdam für das Jahr 1898. P. 917.
Appleton's Popular Science Monthly. New York. Vol. 55.
Dexter, E. G. Influence of Weather on Crime. P. 653.
Symon's Monthly Meteorological Magazine. London. Vol. 34.
[**Symons, G. J.**] Definition of a protracted drought. P. 97.
MacDowall, A. B. Moon in relation to air temperature. P. 104.
Dines, W. H. The Moon and the Weather. P. 117.
Nature. London. Vol. 60.
Buchanan, J. Y. Thermometric Scales for Meteorological Use. P. 364.
——— Ribbon and Dark Lightning. P. 423.
——— Forecast of the Monsoon. P. 438.
Wood, R. W. Dark Lightning. P. 460.
Comptes Rendus. Paris. Tome 129.
Taisserenc de Bort, L. Sur la température et ses variations dans l'atmosphère libre, d'après les observations de quatre-vingt-dix ballons sondes. P. 417.
Science. New York. Vol. 10. N. S.
Wood, R. W. Dark Lightning. P. 337.
National Geographic Magazine. Washington. Vol. 10.
Garriott, E. B. West Indian Hurricane of August 7-14, 1899. P. 343.
Bigelow, F. H. International Cloud Work of the Weather Bureau. P. 351.
Archive des Sciences Physiques et Naturelles. Genève. 4me série. Tome 8.
Gautier, R. Résumé météorologique de l'année 1898 pour Genève et le grand Saint-Bernard. P. 136. (Suite et fin). P. 209.
Ciel et Terre. Bruxelles. 20me Année.
Arctowski, H. Résultats préliminaires des observations Météorologiques faites pendant l'hivernage de la *Belgica*. Pression barométrique. P. 269.
Ventosa, V. La direction du vent et la scintillation (suite). P. 275.
——— Deux stations météorologiques de haute altitude. P. 284.
Pernter, J. M. Réponse aux Remarques de M. Spring sur la couleur bleue du ciel. P. 301.
Spring W. Lettre adressée à M. Lancaster au sujet de l'article précedent. P. 305.
——— Deux stations météorologiques de haute altitude. II. La station de la *Bielasnica*. P. 307.
Solvay, E. Genèse d'électricité atmosphérique. P. 315.
Himmel und Erde. Bruxelles. 11 Jahrgang.
Less, E. Die allgemeine Zirkulation der Atmosphäre. P. 529.
Annalen der Hydrographie und Maritimen Meteorologie. 27 Jahrgang.
Plan zu einer Herausgabe von Dekadenberichten der Witterung durch die Deutsche Seewarte. P. 435.
Popular Science. New York. Vol. 33.
Hazen, H. A. The Moon and the Weather. P. 229.
Journal of School Geography. Lancaster. Vol. 3.
Ward, R. DeC. Equipment of a Meteorological Laboratory. P. 241.

CONDUCT AND THE WEATHER.[1]

By EDWIN GRANT DEXTER, Ph. D.

The paper under the title given above, of which this present article is an abstract, is an attempt to demonstrate by empirical methods a causal nexus between weather states and human activities. That such a relation exists has been popularly recognized for centuries, and, as scientific investigation is for the most part but a more exact determination of what has been common belief, so this study partakes largely of the nature of a quantitative measurement of what had been, at least, qualitatively suspected.

A writer in one of the British magazines some years ago very aptly said:

> There are many persons who are simply victims of the weather. Atmospheric influences play upon them as the wind plays upon the strings of an aeolian harp, with the difference that the latter never utter discords in reply. A leaden sky weighs upon them with a crushing weight, and suggests all manner of unpleasant anticipation. Then the gloomy side of life comes out. The bitter sayings of friends are remembered. The old groundwork of forgotten quarrels is remembered. Uneasy questions arise with regard to the future. One gets tired of life. A sort of indefinite dread is the general mental influence, a faint continuation of the superstitious fancies which mark the childhood of nations and men.

Yet modern science is not satisfied with the mere knowledge of the existence of such influences. Is the cause capable of analyzation into components, each of which may contribute in its peculiar way to the indicated result? To this our answer is "yes." Those states and conditions, mutations and changes in our cosmical environment to which we give the name weather, do not form a unit, but a composite. The various meteorological conditions, ringing in as they do combinations innumerable, are the ever-changing elements of the cause whose relation to human conduct and emotions we are attempting more definitely to define. It is, for the most part, a study of those weather components and their discernible relations to human activities of which this paper treats. The problem carried on is twofold: First, the tabulation and discussion of replies to questions sent to nearly two hundred teachers of all grades from the kindergarten to the high school, superintendents of asylums and reformatories, and wardens of prisons and penitentiaries; second, an inductive study of several hundred thousand data, comparing the occurrence of data of the various classes studied, under definite meteorological conditions, with the normal prevalence of those conditions.

The study was made for the cities of New York, N. Y., and Denver, Colo.

The data considered were taken from the various public records of those cities and consist of misdemeanors in public schools and in penitentiaries, arrests for assault and battery (males and females considered separately), arrests for insanity, the death rate, suicides, clerical errors in banks, and strength tests in the gymnasium of Columbia University. A period of more than ten years is covered, and something over 400,000 data considered.

As a basis for this study, the mean temperature, barometer, and relative humidity, the total movement of the wind, the character of the day, and the precipitation, as recorded at the office of the United States Weather Bureau for each day of the period covered are used.

[1] Conduct and the Weather, an inductive study of the mental effects of definite meteorological condition. Monograph-supplement No. 10 to the Psychological Review. pp. 104.

The occurrence of bad deportment in schools and in penitentiaries, of assault, and of the other classes of data, are then compared with these meterological conditions, and the exact weather upon which they are most prevalent, determined. These relations are shown by means of tables and more than 150 curves.

From these meteorological records, a normal prevalence of definite readings of all the conditions was computed, and this, taken as the *expected* occurrence of the data of conduct for each of those conditions. That is, if it was found that 10 per cent of the days of the year studied had a mean temperature of between 70° and 75° the law of numerical probability would lead us to expect that same percentage of assaults, suicides, etc., to have occurred under that temperature if conditions of heat had no influence. If 15 per cent did actually occur we have a right to infer that great heat increases their number, as indeed, was found to be the case. The relation of *expectancy* to occurrence is shown by curves for all the meteorological conditions and for the various characterizations of the day, with some interesting results.

PRESSURE.

It is shown that for barometrical conditions of low pressure both for New York, N. Y., and for Denver, Colo., the data of nearly all the classes was above the normal expectancy, corresponding deficiencies occurred for high readings of the instrument. When we consider that the average difference in the actual height of the barometric column for the two places is about five inches, nearly five times as much as the variation for either city, it would seem probable that the seeming effect of the barometer is due to other conditions which vary concomitantly with it, and not to the actual density of the atmosphere. If storms were the influencing factor, variations in occurrence would show upon the barometer because of the relation between them and atmospheric pressure without the latter having had more than a secondary effect.

TEMPERATURE.

For now these hot days is the mad blood stirring.—*Shakespeare.*

This quotation from Romeo and Juliet may, perhaps, be taken as an epitome of the results shown by this condition. There are no exceptions to the fact that excessive heat is accompanied by an increase in occurrence. Generally speaking, this increase is somewhat gradual from the lowest temperatures to a point varying for the different curves, but uniformly somewhere between 65° and 80°, at which the increase is very much more rapid. For suicide alone a similar excess is noted for very low temperatures; and this fact may, perhaps, be accounted for by the increased misery such conditions bring to those who are not properly housed.

Although the occurrence of the data studied shows this gradual increase with the heat, the maximum is reached at temperatures of between 80° and 85°, where a very marked decrease is noted. For instance, assaults by women as reported by the New York, N. Y., police, reached an excess of 100 per cent, or double the normal number for temperatures between 80° and 85°, while above that point the numbers fall to 33 per cent less than the normal. This dropping off for the highest temperatures ever experienced is shown for the other classes of data, and is undoubtedly due to the physical impossibility of offensive action under such conditions.

RELATIVE HUMIDITY.

The curves for relative humidity may be divided into two general classes: Those showing a decrease of occurrence as the humidity increases, and those which show no marked tendency either way. To the former class belong cases of assault, of insanity, and misdemeanors in the penitentiary; to the latter, death, suicide, and errors in banks. No class of data studied shows an excess, unless it be a slight one for the last named, for high humidity. This fact is, I believe, rather surprising, for it seems to be a prevalent opinion that occurrences of the nature considered are excessive upon humid days. Indeed, it is so certain that under such conditions we, in some indefinable way, feel ourselves out of our normal balance that I should be inclined to doubt the correctness of a single curve; but with six curves (including that for the schools), based upon the results of nearly 100,000 data, all showing the same trend, we can hardly doubt their validity.

The seeming effects of low humidities for Denver, Colo., were shown to be very great for readings below 30 per cent. Five and six times the normal amount of disorder was experienced both by police and teacher.

Wind.—The effects of the wind upon the emotional states of the various classes of individuals as disclosed by this study have been something of a surprise. In spite of the fact that we so frequently hear people deploring conditions of considerable movement, and asserting that the wind "makes them nervous," the curves taken as a whole fail to show that high winds for the climate of New York, N. Y., have any effect disastrous to mental quietude. In fact, these effects seem to be the reverse, for in spite of many fluctuations, increasing as the data for the groups become less, the general tendency of the curves is downward as they show increasing velocities from the 100–150 mile group.

Some interesting effects were shown for condition of calm. For daily movements of the wind of less than 100 miles, without exception, all classes of disorder showed marked deficiences of occurrence. Assaults and misdemeanors in the public schools were nearly 60 per cent below the normal, and the behavior of the insane under such conditions showed their quieting influence. This effect was hypothetically accounted for by reference to the peculiar composition of the atmosphere in large cities where the movement of the wind is not sufficient to bring about proper ventilation. Dr. J. B. Cohen has shown (see Smithsonian Report, 1895, p. 573) that the proportion of carbonic acid in the atmosphere of the center of the city of Manchester, England, averages nearly three times, for some observations more than four times, that in the outskirts. Although he makes no reference to the fact, it would seem probable that the differences which he found existing for different observations, may have been due to differences in circulation of the atmosphere. Certainly, when the movement was very violent, such variation could hardly exist between city air and that of the country. Recognizing the importance of oxygen and the disastrous effects of carbonic acid gas to the metabolism of life, it would not seem strange if the conditions shown by the curve were influenced by the varying quantities of these gases.

Character of the day and precipitation.—The effects shown for these meteorological conditions seem to be contrary to popular opinion upon the subject. On clear days, which are free from precipitation, both the school teachers and the police have the most trouble in keeping order. Suicide is also shown to be excessive under those conditions.

In conclusion, the whole problem of conduct is referred to that of surplus energy. It is argued that during those meteorological conditions which are most energizing, deportment is at its worst, while during devitalizing conditions active disorder is less prevalent. In other words, that active disorder is, in some sense, the safety valve to surplus energy, which must make itself evident in some form of activity, and that the form taken is likely to be disastrous to the discipline maintained by the teacher and the policeman.

OBSERVATIONS AT HONOLULU.

Through the kind cooperation of Mr. Curtis J. Lyons, Meteorologist to the Government Survey, the monthly report of meteorological conditions at Honolulu is now made nearly in accordance with the new form, No. 1040, and the arrangement of the columns, therefore, differs from those previously published.

Meteorological observations at Honolulu, July, 1899.

The station is at 21° 18′ N., 157° 50′ W.

Pressure is corrected for temperature and reduced to sea level, and the gravity correction, —0.06, has been applied.

The average direction and force of the wind and the average cloudiness for the whole day are given unless they have varied more than usual, in which case the extremes are given. The scale of wind force is 0 to 12, or Beaufort scale. Two directions of wind, or values of wind force or amounts of cloudiness, connected by a dash, indicate change from one to the other.

The rainfall for twenty-four hours has always been measured at 7:30 p. m., not 1 p. m., Greenwich time, on the respective dates.

The rain gage, 8 inches in diameter, is 1 foot above ground. Thermometer, 9 feet above ground. Ground is 43 feet, and the barometer 50 feet above sea level.

Date.	Pressure at sea level.	Temperature.		During twenty-four hours preceding 1 p. m., Greenwich time, or 2:30 a. m., Honolulu time.									Total rainfall at 9 a. m., local time.
		Dry bulb.	Wet bulb.	Temperature.		Means.		Wind.		Average cloudiness.	Sea-level pressures.		
				Maximum.	Minimum.	Dew-point.	Relative humidity.	Prevailing direction.	Force.		Maximum.	Minimum.	
	*	†	†			‡	‡		§				
1	29.89	65	63	82	67	61.5	63	nne.	3-4	1	29.98	29.89	0.00
2	29.87	67	65	84	63	63.7	73	s-w-ne.	0-1	5	29.92	29.82	0.00
3	29.93	71	68	85	66	67.0	76	s-w-e.	0-1	1-9	29.96	29.88	0.00
4	29.98	74	67	84	68	65.7	68	ne.	3	1-3	29.99	29.93	0.00
5	29.93	74	66	82	74	65.5	71	ne.	3	4-8	30.03	29.93	0.10
6	29.90	72	65.5	81	70	63.7	66	ne.	3	5	29.98	29.90	0.04
7	29.92	74	65.5	82	70	62.0	63	nne.	3	2-4	29.95	29.88	0.01
8	29.98	75	68	83	73	61.7	60	ene.	3	3	30.01	29.91	0.01
9	30.01	75	69.5	84	73	64.2	65	ne.	3	7-3	30.06	29.97	0.05
01	29.99	75	69	82	72	66.5	69	ene.	3-5	8	30.05	29.99	0.00
11	30.00	73	69.5	84	75	66.2	68	ene.	3	7	30.06	29.98	0.01
12	29.95	73	66	83	71	64.2	67	nne.	3	2	30.03	29.95	0.05
13	29.97	67	63	85	65	61.2	60	e-n.	1	3	29.99	29.91	0.00
14	29.98	67	64	84	65	63.7	67	sw.	1	4	30.01	29.95	0.00
15	29.96	74	70.5	87	66	65.2	69	s-ne.	0-2	0-6	30.01	29.93	0.00
16	29.97	74	69.5	87	74	70.2	76	ne.	2	7-2	30.01	29.92	0.00
17	30.00	77	70	86	70	67.7	64	ne.	3	3	30.03	29.94	0.00
18	30.01	76	67.5	86	77	66.5	66	nne.	1-3	7-2	30.06	30.00	0.00
19	29.99	76	67	85	75	62.3	58	ne.	2-4	4-8	30.08	29.99	0.00
20	30.00	74	67	84	75	63.5	64	ene.	3	6	30.06	29.98	0.00
21	29.97	72	67.5	83	74	64.3	66	ene.	3	5	30.05	29.96	0.06
22	29.96	75	68	83	71	64.5	70	ene.	3-5	4	30.02	29.91	0.01
23	29.96	75	67.5	84	74	63.3	62	ene.	3	3	30.00	29.92	0.08
24	29.94	74	68.5	82	72	63.5	65	ne.	3	4	30.00	29.92	0.00
25	29.90	72	68.5	85	73	65.0	65	nne.	2	2-6	29.97	29.90	0.02
26	29.91	74	70	85	71	67.5	71	ne.	3	6	29.92	29.85	0.00
27	29.93	75	69	87	71	67.5	69	ne.	2	4-1	29.97	29.90	0.00
28	29.98	76	69	86	74	68.5	70	ene.	3	5	30.03	29.93	0.02
29	29.97	75	68.5	84	75	65.0	63	ne.	2-4	3-1	30.03	29.95	0.00
30	29.95	75	68.5	84	74	65.7	67	nne.	3	2-5	30.02	29.92	0.00
31	29.96	74	67	84	74	65.3	65	ne.	3	6	30.00	29.92	0.01
Sums..	......	......	.....	.....	.....	.....	.....	....	.....	.....	....	......	0.42
Means.	29.96	73.2	67.5	84.1	71.7	64.9	66.6	....	.....	4.2	30.009	29.927	.....
Departure..	—.015	......	......	.....	.....	.....	—3.0	....	0.0	0.0	....	.....	—1.60

Meteorological observations at Honolulu, August, 1899.

Date.	Pressure at sea level.	Temperature.		During twenty-four hours preceding 1 p. m., Greenwich time, or 2:30 a. m., Honolulu time.									Total rainfall at 9 a. m., local time.
		Dry bulb.	Wet bulb.	Temperature.		Means.		Wind.		Average cloudiness.	Sea-level pressures.		
				Maximum.	Minimum.	Dew-point.	Relative humidity.	Prevailing direction.	Force.		Maximum.	Minimum.	
	*	†	†			‡	‡		§				
1	30.00	75	69	85	73	64.5	64	ne.	3	4	30.04	29.94	0.03
2	29.96	75	72	85	71	67.5	71	ne.	4-0	2-5	30.01	29.93	0.11
3	29.94	76	70	86	72	70.3	76	ne.	2-4	4-2	30.00	29.92	0.19
4	29.93	75	69.5	84	73	67.3	71	ne.	3	4-2	29.98	29.91	0.00
5	29.92	76	68	85	74	67.3	69	ene.	3	5-8	29.96	29.89	0.01
6	29.98	75	68	85	76	66.0	66	ene.	3	7	30.00	29.92	0.00
7	30.01	76	70	85	75	64.0	62	ne.	4	7-2	30.04	29.98	0.00
8	29.99	75	68.5	82	75	69.2	76	ene.	1-3	9-4	30.04	29.98	0.28
9	29.98	75	68	84	75	65.2	64	ne.	2-5	2	30.03	29.93	0.01
10	29.94	75	67.5	82	74	67.7	78	ne-nne.	3-5	6	30.00	29.92	0.08
11	29.94	74	68	83	72	64.5	64	ene.	4	4-8	29.99	29.94	0.10
12	29.95	75	68.5	84	71	66.0	68	nne.	3-1	5	30.01	29.94	0.06
13	29.96	75	67	84	74	65.7	67	ne.	3-5	4	30.02	29.95	0.03
14	29.96	75	68	84	75	64.3	63	ne.	4	5	30.01	29.95	0.07
15	29.96	74	69	83	73	64.7	65	ne.	4	6	30.01	29.94	0.20
16	30.00	74	69	83	71	65.7	69	ne.	4	4-8	30.02	29.94	0.14
17	29.96	75	67.5	83	72	66.3	72	ene.	5	8	30.05	29.96	0.02
18	29.93	75	67.5	84	74	64.7	63	nne.	5	4	30.00	29.92	0.00
19	29.94	75	67	84	74	64.5	63	nne.	5	2	29.99	29.91	0.00
20	29.96	71	66	84	75	64.0	62	nne.	4	2	29.99	29.90	0.00
21	29.95	75	69	85	70	63.7	64	nne.	3	4-1-5	29.99	29.90	0.01
22	29.94	74	68.5	84	75	67.7	73	ne-e.	3	9	29.98	29.91	0.06
23	29.93	74	66.5	82	74	67.0	76	ene.	4	9-7	29.98	29.91	0.02
24	29.94	74	67	83	74	62.7	61	nne.	3	4	29.99	29.90	0.00
25	29.97	75	66.5	84	73	63.3	61	ne.	4	3	30.00	29.94	0.01
26	29.98	74	68.5	83	74	63.5	62	ne.	4-5	4	30.01	29.94	0.09
27	29.96	74	67	83	73	65.3	68	ene.	3	7-3	30.04	29.95	0.01

Meteorological observations at Honolulu, August, 1899—Continued.

Date.	Pressure at sea level.	Temperature.		During twenty-four hours preceding 1 p. m. Greenwich time, or 2:30 a. m., Honolulu time.									Total rainfall at 9 a. m., local time.
		Dry bulb.	Wet bulb.	Temperature.		Means.		Wind.		Average cloudiness.	Sea-level pressures.		
				Maximum.	Minimum.	Dew-point.	Relative humidity.	Prevailing direction.	Force.		Maximum.	Minimum.	
	○	†	†			‡	‡		*				
28	29.90	68	64.5	85	74	63.7	63	ne.	3-0	3-1	29.98	29.88	0.00
29	29.89	70	66.5	86	67	64.0	66	nne.	2-0	1	29.92	29.79	0.00
30	29.94	74	69.5	86	68	66.7	71	s-nne.	0-3	6-1	29.96	29.85	0.00
31	30.00	76	68.5	85	72	67.0	69	ene.	3	3	30.04	29.94	0.00
Sums..	....	......	......	......	.....	.....	.....	....	.....	.....	....	.....	1.53
Means.	29.96	74.3	68.1	84.0	73.0	65.6	67.3	....	3.3	4.5	30.00	29.92	....
Departure..	—0.01	......	......	—0.3	—0.3	.....	—1.3	....	.....	+0.5	......	......	—0.50

Mean temperature for July, 1899 (6+2+9) ÷ 3=77.0°; normal is 77.3°. Mean pressure for July (9+3) ÷ 2 is 29.970; normal is 29.995.

* This pressure is as recorded at 1 p. m., Greenwich time. † These temperatures are observed at 6 a. m., local, or 4:30 p. m., Greenwich time. ‡ These values are the means of (6+9+2+9) ÷ 4. § Beaufort scale.

Mean temperature for August, 1899, (6+2+9) ÷ 3=77.3°; normal is 77.6°. Mean pressure for August (9+3) ÷ 2 is 29.96; normal, 29.98.

* This pressure is as recorded at 1 p. m., Greenwich time. † These temperatures are observed at 6 a. m., local, or 4:30 p. m., Greenwich time. ‡ These values are the means of (6+9+2+9) ÷ 4. § Beaufort scale.

On the 24th earthquakes reported at Hilo, Hawaii, and Tanoke, over Mauna Loa.

AUTOMATIC RECORDS OF A THUNDERSTORM.

By H. H. KIMBALL, Weather Bureau.

On the afternoon of August 2, 1899, a severe thunderstorm, accompanied by destructive winds and hail, passed over the District of Columbia and the adjacent counties of Maryland. The center of its path, and also the region experiencing the greatest destructive effect, were a few miles to the east of Washington. The Central Office of the Weather Bureau did not, therefore, feel the full force of the storm; but the records obtained from some of the automatically recording instruments in operation in the Instrument Division are believed to be of sufficient interest to warrant their reproduction.

All recording instruments employed by the Weather Bureau are furnished with pens in which a purple aniline ink is used. This color prevents the direct reproduction of records by photographic processes. Blank record sheets were, therefore, superimposed over the sheets containing the instrumental records of this storm, and the records were traced in by hand with india ink. Full size photo-engravings of these traced records were then obtained, from which the diagrams on Fig. 1, page 357, were printed.

Full descriptions of most of the instruments employed may be found in Circulars D, E, F, and G, Instrument Division, and also in Part I, Report of the Chief of the Weather Bureau, 1891–1892.

The following brief description of the records, and the manner in which they are obtained, is for the benefit of those not familiar with the instrumental equipment of Weather Bureau stations.

On Fig. 1 the record marked *A* is from the so-called quadruple register, sometimes called the triple register, in general use at stations. The record is in four parts designated *a*, *b*, *c*, and *d*.

The part of *A*, designated *a*, represents the direction from which the wind was blowing, and is obtained by means of four automatic circuit closers attached to a rod that turns with the wind vane. A "minute contact" on the register clock completes the circuit through the proper magnet or magnets, and the corresponding direction is marked on the record sheet by printing arms attached to the magnet armatures.

The part of A, designated b, shows the velocity of the wind as indicated by a Robinson anemometer exposed 39 feet above the roof of the Weather Bureau building. Five hundred revolutions of the anemometer cups, which are mounted on arms 6.72 inches long, are supposed to represent one mile of wind. A pin on a dial wheel depresses a contact spring and closes an electric circuit at the end of each 500 revolutions, causing the register pen, which is attached to the magnet armature, to make a short offset from its normal trace. The ninth and tenth pins are connected by a bridge, so that from the beginning of the ninth to the end of the tenth contact a continuous offset is made, and the mile record marks are divided off into groups of ten. The recorded miles per hour can, if desired, be converted into true miles per hour by a table in the circular D above mentioned.

The part of A, designated c, represents the duration of sunshine, and the record is obtained by means of a differential air thermometer, the effect of sunshine being to heat and expand the air in the black bulb of the thermometer more than in the bright bulb, causing a mercurial column to rise and close a circuit that is completed each minute by the register clock. A suitable cam wheel causes the pen attached by an arm to the magnet armature to take successively five steps in one direction, and then a like number in the other.

The part of A, designated d, is the rainfall record from the tipping-bucket gage, a bucket with two compartments being pivoted under the funnel-shaped collector of the gage so that it tips for each .01 inch of rain collected, and each tip of the bucket closes the circuit through the same magnet that actuates the sunshine-record pen.

We thus obtain from this one register continuous records of the direction and velocity of the wind, the duration of sunshine, and the amount and rate of rainfall.

B, Fig. 1, is the wind velocity recorded by the Richard Brothers' anemo-cinemograph, which is actuated by the same anemometer that gave us b, described above. For this record, however, the circuit through the magnet is closed for every six and a quarter revolutions of the anemometer cups. Each movement of the magnet armature raises the pen a short distance on the record sheet. A clock movement, controlled by a governor working in sympathy with the magnet armature, tends constantly to carry the pen toward the bottom of the sheet. A perfectly steady wind of, say, 25 miles per hour, would cause the pen to rise to the twenty-fifth line on the sheet, maintain its position, and produce a straight longitudinal trace. A variable wind would keep the pen rising and falling between the lines representing its maximum and minimum velocities.

C, Fig. 1, is the temperature record made by a Richard Brothers tele-thermograph. The thermometer bulb employed is a Baudin pressure tube filled with alcohol. A change in temperature produces a slight movement in the free end of the bulb, which movement is magnified by means of levers and employed to close circuits through magnets on the register, which operate the recording pen. The pen moves by intervals of a half degree Fahrenheit.

D, Fig. 1, represents the pressure changes recorded by Professor Marvin's normal mercurial barograph, having a barometer tube suspended from the short arm of a balance beam. A change in the air pressure causes a slight movement of the beam, thereby closing an electric circuit. The movement of the magnet armature turns a screw and shifts a weight on the long arm of the beam, and the movement of this weight, which restores the equilibrium of the beam, is recorded by a pen; each movement of the weight or pen represents a change in air pressure of .0001 inch.

E, Fig. 1, is a record of the rainfall from Professor Marvin's weighing rain and snow gage. The rain falling into a collector 8 inches in diameter flows into a receiver resting on a balance, and the counterpoise on the arm of the balance is moved electrically for every .001 inch of rainfall. The recording pen is made to move simultaneously with this weight when a double-threaded screw is turned by the motion of the magnet armature on the register, and the thread of the screw advances the pen either down or up the record sheet, depending upon the amount of rain that has fallen. Once across the sheet represents .50 inch of rainfall. The longitudinal traces numbered 29, 30, 31, and 1 indicate the absence of rainfall on the four days preceding August 2.

The time scales are all plainly marked on the record sheets, except in the case of A. Here the double lines numbered 3, 4, 5, and 6, near the top and bottom, represent, respectively, 3 p. m., 4 p. m., and 5 p. m. The figures 9, 10, 11, and 12 midnight belong to a wind direction record made six hours later than that here given, and which was cut out, as not being necessary to the history of this storm. The scales for wind velocity, temperature, pressure, and rainfall, are also plainly marked on B, C, D, and E, respectively.

There is always a time error in the records, just as there is in a watch or clock, but it is not so easily determined. This time error is partly due to the rather cheap grade of clock movements employed, partly to errors in setting the pens, and partly to imperfect connections between the clock movements and the register cylinders.

It is customary to make a "time record" at some convenient hour on most instruments, but this is not done in the Instrument Division, since the instruments are kept in operation mainly for experimental and exhibition purposes. The Forecast Division has a complete set of instruments from which the official records for Washington are taken. All the pens were set at noon of August 2, except the tele-thermograph pen, C. The clock on this instrument was gaining rapidly, and the pen was probably thirty minutes fast.

By a slight defect in the register, the wind direction printing points and the sunshine and rainfall recording pen on the quadruple register were thrown about two and a half minutes ahead of the wind velocity pen. This latter, and the pen on the anemo-cinemograph were about three minutes faster than the official wind record for Washington, which, together with D and E, are assumed to have been recorded correctly on standard eastern time.

Making allowances for the time errors of a, b, c, d, B, and C, the records give us the following history of the thunderstorm of August 2.

Previous to the storm the general direction of the wind was from the south, a, the velocity averaging about 15 miles per hour, b and B, and increasing gradually; B brings out very clearly the characteristic irregularities in its velocity.

The sun was shining from 2:25 p. m. to 3:06 p. m., and during this time the maximum temperature of the day, 89°, occurred, C. The record of a maximum recording thermometer shows that the tele-thermograph was reading 1° low at this time. Cloudiness prevailed after 3:06 p. m., and the temperature fell slowly. The pressure was decreasing rapidly, D.

At 4:25 p. m. there was a diminution in the velocity of the wind, followed at 4:32 by a sudden gale that reached an extreme velocity of 1 mile in sixty-five seconds, or 55 miles per hour at 4:35 p. m., b, or 47 miles per hour by the anemo-cinemograph record, B.

The wind direction backed from the south to southeast, east, northeast, north, and northwest, between 4:29 p. m. and 4:38 p. m., after which it veered to the north, northeast, and east, a.

Simultaneously with the commencement of the gale the temperature began to fall rapidly, a change of 15° being recorded in about five minutes, C.

Three barographs, in addition to the Marvin normal barograph, were in operation at the Central Office at this time,

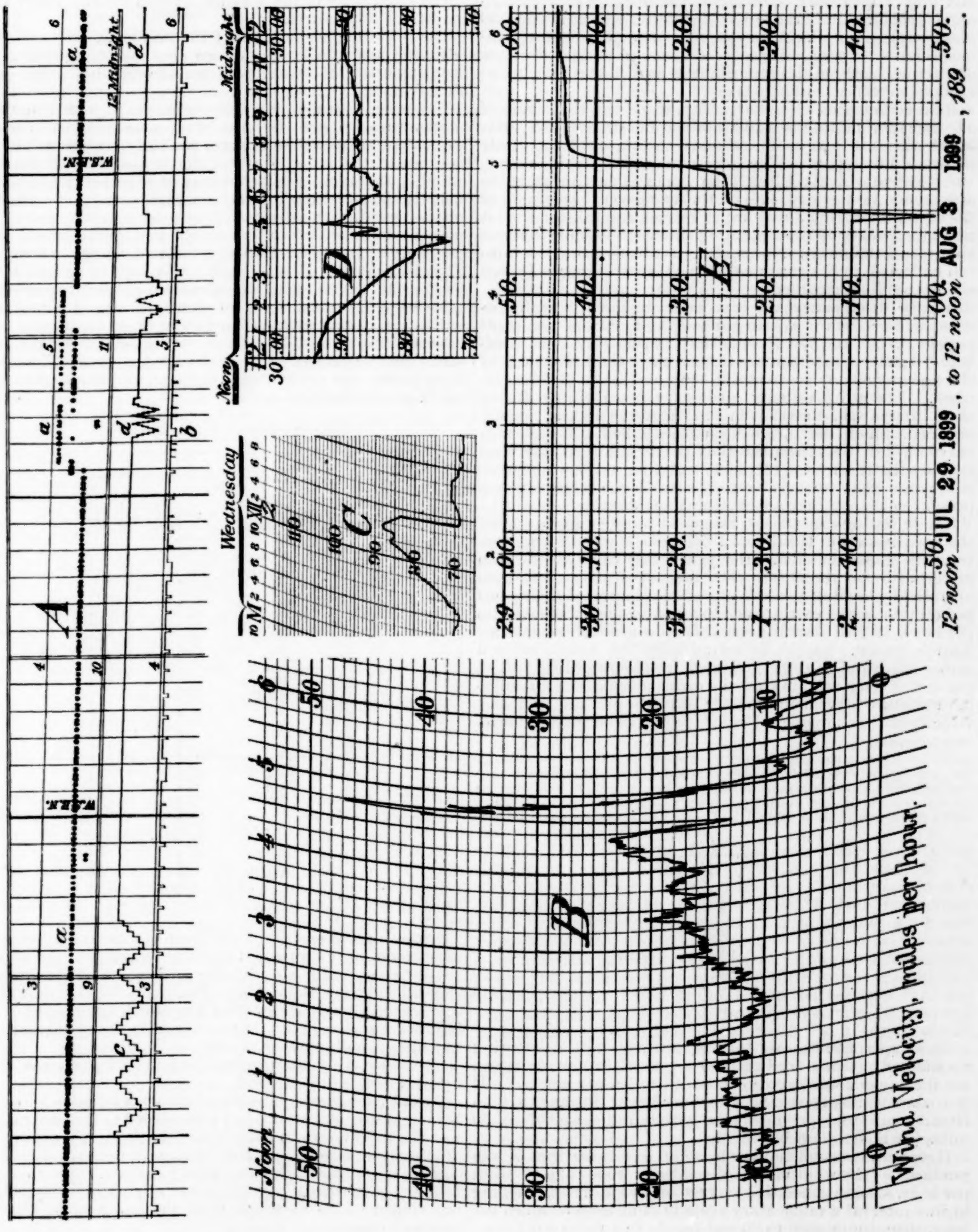

FIG. 1.—Automatic records of the thunderstorm August 2, 1899, at Washington, D. C.

and they all agree in showing the occurrence of the minimum pressure in advance of the storm, and at about 4:20 p. m., as shown at *D*. A very rapid increase in pressure commenced at 4:27 p. m., the recorded increase being at the rate of .10 inch in three minutes, which is as fast as the electrical mechanism can move the pen.

Rain commenced to fall at 4:35 p. m., *E* and *d*. A rate of .05 inch per minute was maintained for six minutes, after which the rate was quite irregular. Rain did not entirely cease until 6:12 p. m. The total amount was .50 inch by *d*, and .554 inch by *E*. This discrepancy is partly due to the differences in the exposure of the two gages, but largely to the fact that during a very rapid rate of rainfall the time it takes the bucket of the tipping-bucket gage to tip introduces an error in the recorded amount. On this occasion the rainfall collected in the gage was .53 inch by stick measurement against .50 inch recorded.

A large discrepancy has been noted in the extreme velocities recorded by the anemo-cinemograph and the quadruple register, i. e., 47 and 55 miles per hour, respectively. The quadruple register can do no more than show the time taken by the anemometer cups to make each successive 500 revolutions. The wind velocity must vary considerably during these intervals, and we thus fail to record the highest velocity attained, which may have been maintained a few seconds only. When we remember that the pressure of the wind varies with the square of the velocity, we see how desirable it becomes that we be able to measure these extreme velocities, even though they are of such short duration.

The following experiment was made in order to determine the sensitiveness of the Richard register. It was disconnected from the anemometer and the pen finally came to the zero velocity line on the sheet. The magnet armature was then operated by hand at the rate of eighty closures of the circuit per minute, which corresponds to a wind velocity of 60 miles per hour. After nine minutes this movement of magnet armature ceased. In the following table the second column shows the wind velocity indicated by the recording pen at the end of each minute after the commencement of the magnet armature movement, and the third column the indicated velocity at the end of each minute after the armature movement ceased.

Test of sensitiveness of Richard Brothers' anemo-cimemograph.

Time.	Indicated velocities.	
	80 armature movements per minute.	Armature at rest.
Minutes.		
0	0	58
1	19	39
2	32	27
3	41	18
4	46	12
5	50	8
6	53	6
7	55	4
8	57	3
9	58	2

This experiment shows that should a 60-mile gale spring up suddenly from a dead calm and prevail for four minutes, the instrument would only record 46 miles per hour. Or if the wind suddenly sprang from a 19-mile breeze up to a 60-mile gale and prevailed for four minutes as before, 50 miles per hour would be recorded.

It was under conditions somewhat like these that *B* was produced. The wind increased suddenly from 13 to 50 miles per hour, *b*, maintained this average for five minutes, reaching in this interval a momentary velocity of at least 60 miles per hour, then diminished to 26 and finally to 4 miles per hour.

The superiority of the Weather Bureau register under such conditions is manifest.

The recording mechanisms of the rain gages are capable of following any rate of rainfall we may expect, excepting the resulting error in the record from the tipping-bucket gage, already noted.

The same is true of the tele-thermograph with respect to temperature changes; but the latter instrument can not follow sudden temperature changes perfectly, on account of the slowness of the bulb to attain the temperature of the surrounding medium. Just what may be expected of the instrument is shown by the following readings made on a thermograph recording mechanically instead of electrically, but having a bulb similar to that on the tele-thermograph. The thermograph was suddenly subjected to a change in temperature of about 40° F., and the air was kept in motion by an electric fan. Although the instrument shelter may never be quite so well ventilated as to admit of an air circulation equivalent to that maintained during these experiments, yet the ventilation must have been very good during the high winds that accompanied the storm of August 2. The fall in temperature was not so rapid, however, as was observed during these experiments.

Test of sensitiveness of thermograph bulb.

Time.	First experiment.	Second experiment.	
	Thermograph readings.	Mercurial thermometer readings.	Thermograph readings.
Seconds.	°	°	°
0	113.0	106.0	106.0
5	107.0	99.0	101.0
10	101.5	93.0	97.0
15	97.0	90.0	93.0
20	92.5	86.5	90.0
25	89.5	84.0	88.0
30	86.5	82.0	85.5
35	84.0	80.0	84.0
40	82.0	78.0	82.0
45	80.5	77.0	80.5
50	79.0	76.0	79.0
55	77.5	75.0	78.0
60	76.5	74.2	77.2
65	75.5	73.5	76.5
70	75.0	73.0	76.0
75	74.2	72.8	75.2
80	73.5	72.3	74.5
85	73.0	72.0	74.0
90	72.6	71.7	73.7
95	72.2	71.5	73.4
100	72.0	71.2	73.0
105	71.6	71.0	72.8
110	71.4	71.0	72.5
115	71.2	71.0	72.4
120	71.0	71.0	72.3
125	70.8	71.0	72.1
130	70.6	71.0	72.0
135	70.5	71.0	71.8
140	....	71.0	71.7
145	....	70.8	71.6

The automatic records of the storm of August 2 substantiate most beautifully Professor Davis's explanation of the cause of the increase in the air pressure in front of a thunderstorm. (See Elementary Meteorology, Davis, pp. 263–4, Fig. 100.)

We have already stated that the storm approached Washington from the north. It passed off to the southeast, only its edge extending over the city.

The south wind that prevailed up to 4:29 p. m. was, therefore, a *warm inflowing wind*.

At this time the air pressure, which some minutes previously became nearly stationary, had commenced to increase rapidly, and the wind began to back around to the north, the reversal of direction being completed in three minutes. A *cold outrushing wind* then prevailed at the surface. The rain soon followed the squall and the wind gradually became light, but continued to blow out from the storm until after the rain had ceased.

THUNDERSTORMS ON AUGUST 2, 1899.

By ALFRED J. HENRY, Chief of Division.

On August 2, 1899, thunderstorms were observed in almost every State and Territory of the Union. In the majority of cases the storms brought a welcome shower of rain and cooled the heated atmosphere. In the Middle States, however, particularly over a region 300 miles in width, extending from the Adirondacks southward to the Lower Potomac, the storms were of unusual violence. In many cases large trees were uprooted or broken off, barns and outbuildings were prostrated by the force of the wind, and fields of grain and tobacco were beaten down and destroyed by the hail. The electrical discharges were numerous and exceedingly destructive of human life. Four persons were killed by lightning stroke in New York, four in Pennsylvania, and one each in New Jersey, Maryland, West Virginia, and New Hampshire. In addition to the foregoing, two persons were killed in Montana and one in Indiana, making a total of fifteen casualties by lightning for the day. A mother and two children were blown into the Patuxent and drowned, and three other persons lost their lives as a direct result of the fury of the wind.

The distribution of pressure and temperature and the direction of the wind at 8 a. m., seventy-fifth meridian time, are graphically shown on the small chart below, Fig. 2.

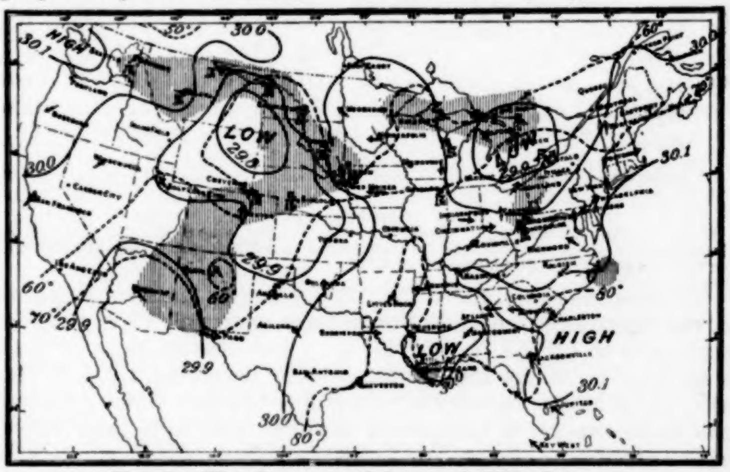

FIG. 2.—Weather map of August 2, 1899, 8 a. m.

Two weak cyclonic systems appear on this chart. The first covers the northeastern slope of the Rocky Mountains; the second lies over Lakes Huron, Erie, and Ontario. The thunderstorm symbol is shown at those stations where thunderstorms occurred within the preceding twelve hours. The occurrence of a thunderstorm at the hour of observation has been indicated by placing the letter R at the station in addition to the thunderstorm symbol. It will be noticed that thunderstorms were in progress at Bismarck, N. Dak.; Huron, S. Dak.; and Sioux City, Iowa, in the West, and at Parkersburg, W. Va., in the East at the morning observation hour.

Passing directly to the consideration of the eastern group of thunderstorms, with which we are most interested, we may observe, first, that the position of the dominating cyclonic system is particularly favorable to the rapid development of thunderstorms throughout central and eastern New York, eastern Pennsylvania, New Jersey, Delaware, and Maryland, since those regions will probably remain within the influence of the cyclonic circulation during those hours when the vertical circulation in the lower air is most active.

At the morning observation of August 2, immediately to the southward of the storm center, the weather was clear, with light westerly to northwesterly winds. To the southeastward, in Maryland and the District of Columbia, a relatively small area of cloudy weather prevailed, while in eastern Pennsylvania and New Jersey it was clear. The temperature was slightly above normal from the Potomac northward to the St. Lawrence Valley, and light southerly to southwesterly winds prevailed over the greater part of this region.

In the upper half of western Pennsylvania, and in western New York, cloudiness increased during the forenoon, and light thunderstorms occurred here and there. By 1 o'clock p. m. the area of increasing cloudiness and rain had moved to central Pennsylvania and New York, and numerous light thunderstorms began to develop in this region and move in a northeasterly direction with the general surface winds. These storms were separate and distinct; they do not appear to have united in a general storm front, nor to have attained marked violence. Their progressive motion seemed to be wholly with the surface winds, much as an eddy floats down stream with the current.

The first and only series of severe southwesterly storms occurred in northeastern New Jersey in the towns of Plainfield, Dunellen, Flemington, Newark, and Elizabeth. The place last named, in particular, suffered heavily. The force of the wind was so great that many persons believed the city had been visited by a tornado. While there is every reason to believe that the wind assumed hurricane force in streaks throughout portions of its track through the city the evidence as to its tornadic character is not conclusive.

At the same time that the southwesterly storms were advancing over northeastern New Jersey and southeastern New York, a severe thunder and hail storm began to move in a southeasterly direction through the central districts of Maryland. Many details in regard to the this storm were collected by Mr. F. J. Walz, Director of the Maryland Climate and Crop Service, who has published a summary of his conclusions in the August bulletin of that service. We make the following excerpts from Mr. Walz's report:

In interior Maryland the storm was severe over a large area, extending from eastern Washington and western Carroll counties in a southeastern direction to Calvert and St. Mary counties. On the western limits of the storm's path the winds reached their highest velocities from the northwest, while on the eastern limits the more violent winds came from the northeast.

In the storm stricken region 139 buildings, including barns and sheds, were destroyed by the wind; 3 were struck by lightning and burned; 7 were damaged by lightning, and 43 by the wind.

In the northern portion of the storm's path the main loss was occasioned by hail. Where the winds were the highest and the lightning most incessant there the hail was the heaviest. In some places hail lay unmelted for hours, and some of the elongated forms were 6 inches in length. In the areas of great destruction by hail the damage occurred largely in streaks or parallel bands, with intermediate strips that were left untouched.

The storm in Maryland differed from those more to the northward, in that it was well united, compact, and retained its violence over a course about 100 miles in length, which it traversed in about two hours. It swept over the country much as a swift steamer makes headway against a current. Immediately on its front the outrushing squall winds came from a northerly quarter, but as soon as the disturbance had passed, the surface winds took up their former course, viz: from the south. Later in the day, in southeastern Pennsylvania and New Jersey, thunderstorms developed and moved in a southerly direction, accompanied by a severe squall wind from the north, but no sooner had ~~the~~ disturbances passed the point of observation than the winds resumed their previous directions, viz, from a southerly quarter, as in the case of the Maryland storm. These temporary incursions of north winds, with thunderstorms, while seemingly of no avail as regards effecting an immediate change in the direction of the surface winds were evidently the forerunners of a general shift of the winds to the west and northwest, with clear weather and lower temperature. I have thought it of interest to note the times when the wind shifted to the westerly quarter at weather Bureau stations in the region under con-

sideration. Beginning at the most northerly, that is the station nearest the storm center, these times were: Albany, N. Y., 6:15 a. m., August 3; Binghamton, N. Y., 9:30 a. m., 3d; New York, N. Y., 11:50 p. m., 2d; Philadelphia, Pa., 2 a. m., 3d; Harrisburg, Pa., 7 a. m., 3d; Baltimore, Md., 12:25 a. m., 3d; Washington, D. C., 1:30 a. m., 3d.

In looking for an explanation of the severity of the storms in New Jersey and Maryland are met with that bugbear of almost all scientific investigation, "insufficient data." The only suggestion we have to offer is that the atmosphere in the localities named was more humid (relative humidity 92 per cent at Washington, D. C., and 82 per cent at Baltimore, Md., on the morning of the 2d) and that the vertical circulation, as indicated by the formation of cloud early in the day, was more active than in adjacent districts. The eastward drift of the cyclonic system that covered the Lake region in the morning would bring it into districts whose atmospheric conditions, from the causes just mentioned, were already in a highly favorable state for the development of thunderstorms. This might also be offered as accounting, in a measure, for the severity of the storm.

OBSERVATIONS AT RIVAS, NICARAGUA.

Simultaneous observations at 1 p. m. Greenwich (or 7:17 a. m. local) time, August, 1899.

Date.	Temperature.		Wind.		Upper clouds.			Lower Clouds.		
	Air.	Dew-point.	Direction.	Force.	Kind.	Amount.	Direction from.	Kind.	Amount.	Direction from.
	°	°								
1	79	73	se.	5				k.	Few*	*se.
2	79	73	se.	2	ck.	10	sw.	k.	Few	se.
3	79	75	ne.	3				ks.	3	ne.
4	77.5	74	ne.	3				k.	10	ne.
5	78.5	75	ne.	3	ck.	10		ks.	Few	ne.
6	79.5	73	ne.	5				ak.	10	ne.
7	79.5	72	ne.	6				fk.	5	ne.
8	80	73	ne.	6				fk.	1	ne.
9	79	73	ne.	5	c.	1	sw.	fk.	1	ne.
10	80	76	ne.	3	cs.	5	e.	fk.	Few	ne.
11	79.5	76	ne.	1				ak, k.	9	ne.
12	80.5	75	ne.	2	cs.	9	se.	k.	1	ne.
13	80	76	se.	3	ck.	9		k.	1	se
14	77.5	75	nw.	0				k.	10	se.
15	80	76	e.	3				fk.	9	e.
16	78.5	75	ne.	3				k.	10	ne.
17	80	73	ne.	4				fk.	8	ne.
18	80	73	se.	4				k, ks.	10	se.
19	78	74	ne.	5				fk.	1	ne.
20	78.5	75	ne.	3				ak.	9	ne.
21	79	73	ne.	6	ck.	2		k.	7	ne.
22	80	73	e.	5				ak, k.	5,2	se., e.
23	79	75	ne.	5				k.	10	ne.
24	78.5	75	se.	4				ak, k.	10	se.
25	76	73	ne.	2				k.	9	ne.
26	74	74	†	0				kn.	10	n.
27	75.5	72	ne.	0				ak.	10	ne.
28	75.5	72	ne.	5				ak.	7	ne.
29	77	73	ne.	3	ck.	10		k.	Few	ne.
30	75.5	72	ne.	0	cs.	2	se.	k.	1	ne.
31	76.5	74	se.	1	cs.	5		ak.	Few	se.
Means	78.4									
Departure	+1.50									

*On Ometepe. †n. by w.

Climatological observations for twenty-four hours ending at 7:17 a. m. local (or 1 p. m. Greenwich) time, August, 1899.

Date.	Temperature.		Wind.		Average cloudiness.	Total rainfall.
	Maximum.	Minimum.	Prevailing direction.	Maximum force.		
	°	°				Inches.
1	82	77.5	ene.	5	9	0.00
2	88	77	e., se.	7	3	0.00
3	87.8	77.6	ne-e.	5	5	0.01
4	86	78	ne.	5	9	0.19
5	87.5	76	ne.	4	7	0.02
6	88	77	ne.	6	6	0.06
7	85.8	78	ne.	5	9	0.00
8	89	78	ne.	7	8	0.00
9	87	79	ne-e.	6	6	0.00
10	89	77.6	ne.	5	7	0.00
11	88	78	ne.	4	3	0.03
12	87	78	ne.	3	8	0.00
13	89.1	78	ne.	3	10	0.00
14	86	79	se.	5	10	0.17
15	87	77	ese.	4	7	0.58
16	88	78	ne-e.	5	9	0.03
17	86.5	77	ne.	4	7	0.04
18	87	76.8	ne.	5	8	0.01
19	81	76	e-ne.	6	10	1.20
20	85.5	76	ne., se.	5	6	0.20
21	84	77.4	ne-e.	5	7	0.46
22	82.5	77.5	ne-se.	7	7	0.06
23	83	78	*	7	4	T.
24	83	79	ne-se.	6	7	0.95
25	84.3	77.5	e-se.	7	10	0.34
26	80.2	74.5	ne-se.	3	9	2.22
27	78	74	n-se.	2	10	1.02
28	82	75	ne-e.	4	9	0.00
29	84.5	75	ne.	6	6	0.07
30	84	76	ne-se.	5	8	1.40
31	85	73.5	ne-e.	3	7	0.22
Sums						†9.28
Means	85.0					
Departure						+1.21

* ne. by e.

†0.02 inch that fell on July 31 should be added to the above, and 0.05 that fell on the afternoon of August 31 should be transferred to the September rainfall, thus the corrected rainfall for August becomes 9.25.

The records contributed for many years by Dr. Earl Flint, at Rivas, Nicaragua, include barometric readings. His present station is at 11° 26′ N., 85° 47′ W. The observations at 7:17 a. m., local time, are simultaneous with Greenwich 1 p. m. The altitude of this barometer is now said to be 4 feet above ground; the thermometer 6 feet above ground; the rain gage 7 feet above ground. The ground is 210 feet above sea level. Until the barometer has been compared with a standard it seems hardly necessary to publish the daily readings. The wind force is recorded on the Beaufort scale, 0–12. When cloudiness is less than $\frac{1}{10}$, the letter "F," or "Few," is recorded

This station is situated on the western shore of Lake Nicaragua, not far from the eastern end of the western division of the Nicaragua Canal. The volcano Ometepe, on an island in Lake Nicaragua, is about 10 miles northeast of the station. Dr. Flint's records occasionally mention the presence of clouds on the summit of this mountain.

Dr. Flint's reports to the Weather Bureau now embrace two distinct features, namely, the simultaneous morning observations and the daily climatological summary, as given in the two preceding tables for each month.

NOTES BY THE EDITOR.

A NEWSPAPER TORNADO FAKE.

In mining engineering a fake is a worthless, deceptive stratum among the valuable ones; in theatrical usage it means a worthless piece of stage property or rubbish; in popular American usage it means a story that is plausible, and at first readily believed, but on investigation turns out to be a fiction that was intended to deceive, i. e., a cheat and a lie.

We regret to have to use this word so often, but it is expressive and appropriate. The popular interest in meteorology is intense, and thousands whose business depends upon knowing the exact truth do not generally care to stop and investigate a dubious startling novelty—they come straight to the Weather Bureau and overwhelm our observers with questions; they seem to look to the Bureau to protect them

from fake alarms quite as implicitly as from genuine storms and frosts.

Fakes are not mere harmless jokes; they often lead to important public action. The "promoter" of a wild cat money-making scheme, a South Sea Bubble, or other fraud, is a fakir; his story is a fake, and a whole nation may be prostrated by being drawn into the delusion. We in America have had Locke's Moon Hoax, and numberless artificial rain delusions to warn us of the danger of allowing errors and fakes to spread freely and uncontroverted through the daily papers.

Several eastern papers reprinted in July, from the San Francisco Call, the story about John Rhodes, the Rough Rider and his cannon in the town of Hennessey, Okla., where "three times this year has a charge of salt, fired from an old Armstrong cannon put waterspouts and tornadoes out of business."

The Weather Bureau observer at Oklahoma, Okla., informs us that the whole story is a fiction; nothing whatever has occurred at Hennessey to warrant such a reflection upon the common sense of its inhabitants.

DISPLAY OF FORECAST CARDS ON STREET LETTER BOXES.

From a note in the July report of the Alabama Section, we learn that Mr. F. P. Chaffee, Section Director at Montgomery, has put into operation the system of displaying local forecast cards on the street letter boxes. A neat tin pocket is placed over each letter box, and the forecast cards are furnished to the letter carriers who post them as they make their regular rounds. A similar arrangement is also in force at Springfield, Mo. This cooperation of the post office officials involves but little labor on their part, and is highly appreciated by the public.

IMPROVEMENTS IN MAP OF THE SECTION REPORTS.

We notice that several of the recent section reports are printed upon a more highly calendered paper than has hitherto been used. The soft paper does not allow of printing very delicate maps by the chalk plate process, but the more highly calendered surface and greater pressure bring out more delicate details and give a finer appearance to the printed map.

CHEMISTRY OF VEGETATION.

Mr. E. A. Evans, Section Director, Richmond, Va., publishes in the July report of the Virginia Section the concluding portion of an article on the green coloring of plants, which was originally published in Harper's Monthly for April, 1897. The whole question of vegetable physiology, both from a chemical and physical point of view, is very obscure and yet its importance requires us to carefully consider every new observation and theory. In general, every plant adapts itself to its surroundings and as the latter present an infinite variety of combinations of soil and climate, therefore a corresponding variety is found in plant life. Modern agriculture is largely a matter of general experience and field statistics, but in some cases decided improvements have been suggested by the minute studies of the chemists and physicists.

THE DIRECTION OF ROTATION.

Objection has been made to the Editor's note on page 157 in reference to the use of the term "from right to left or counter clockwise." He is assured that the expression "the whirling motion was from right to left" would generally be considered as quite clear and precise, and that this will always be understood to mean that "the whirling motion was from the right-hand forward over to the left-hand." If this were a well-recognized meteorological usage, the expression "from right to left" would be clear, precise, and satisfactory; but as there may be some doubt on the subject, the Editor thinks that the expression "from the right-hand forward over to the left, or simply "from the right-hand forward" would be a better form if any one needed to replace the well-recognized technical expression "counter clockwise." The expressions "clockwise" and "counter clockwise" are preferable in meteorology.

In machinery and mechanics the term "right-handed screw" is applied to one that moves forward when turned in the direction from the left forward over to the right, or clockwise, doubtless because this is the easiest twist for the right-hand to give. Hurricanes and tornadoes in the Northern Hemisphere generally revolve counter clockwise, as charted on daily maps, or from the right-hand forward over to the left, or from the right-hand forward; so also does the earth itself, both in its diurnal rotation around its axis, and its annual revolution around the sun, when looked at from the northern side.

The term right-handed rotation is applied to a body passing from in front of us around by the right to the rear, or one that passes from above and in front of us downward and over to the right until it comes below its first position; these both correspond to the clockwise rotation. A ray of polarized light is said to have right-handed rotation when, as it moves forward, it also rotates clockwise.

In botany the tendril of a climbing plant may be spoken of as growing forward with a right-handed twist, whereas some authors formerly used the opposite term because they considered themselves as standing in front of the tendril and looking back at it as it twisted forward toward them.

Similarly in meteorology the ascending air in a tornado seems to rotate counter clockwise if we look down upon it from above, but if we look from below upward in the direction in which it is rising or advancing then we see that it has the right-handed twist or the positive rotation, as that term is used in mechanics, electricity, and magnetism. In mathematical studies, the direction of rotation should be stated as it appears to a person who is looking forward in the direction of the motion of translation or in the direction of the positive distances if there be no motion of translation. The terms *positive* and *negative* belong to mathematics and mechanics; the terms *clockwise* and *counter clockwise* may be retained in descriptive meteorology.

We quote the following from page 24, Vol. I of Maxwell's "Treatise on Electricity and Magnetism":

> The combined action of the muscles of the arm when we turn the upper side of the right-hand outward, and at the same time thrust the hand forward, will impress the right-handed screw motion on the memory more firmly than any verbal definition. A common corkscrew may be used as a material symbol of the same relation.

Prof. W. H. Miller has suggested to me that as the tendrils of the vine are right-handed screws and those of the hop left-handed the two systems of relations in space might be called those of the vine and the hop, respectively.

The system of the vine which we adopt is that of Linnæus, and of screw-makers in all civilized countries except Japan. De Candolle was the first who called the hop tendril right-handed and in this he is followed by Listing, and by most writers on the circular polarization of light. Screws like the hop tendril are made for the couplings of railway carriages, and for the fittings of wheels on the left side of ordinary carriages, but they are always called left-handed screws by those who use them.

STANDARD TIME.

The Editor has previously had occasion to explain how the study of the reports of auroras and earthquakes collected by the Signal Service led him, in 1874, to see that accurate results could never be deduced from the numerous reports and conflicting statements unless some simple standard of time could be adopted by the whole community. In those days every railroad and city had its own standard and sometimes half a dozen different clocks could be found in the same central or union depot. In May, 1879, he presented a report to the American Metrological Society of New York, recommending the system of hourly meridians counted from Greenwich, as a first step toward the universal use of Greenwich time itself. When this recommendation had been adopted by the railroad and transportation companies, through the active advocacy of W. F. Allen, as general superintendent of railroad time tables, and when it had been recommended by the International Time and Meridian Conference there was no longer any doubt that it would eventually, but perhaps slowly, be adopted throughout the world.

These expectations have already been most fully realized. In a few cases smaller subdivisions, such as a half or quarter of an hour, have been preferred. We believe that France still holds out against the Greenwich meridian and prefers that of the Paris Observatory. The last important government to agitate the subject is that of the Empire of India. According to Science and the London Times the last issue of the Proceedings of the Asiatic Society of Bengal contains a paper on this subject by the Superintendent of the Geological Survey of India, Mr. Oldham, who describes the present system of that country as simply "barbarous." The railways and the telegraph department adopt Madras mean time, but each town and city has its own time, which is neither local mean time nor any other time. It requires forty-four pages of the official telegraph guide book to enumerate the local variations from the standard time. Mr. Oldham states that inextricable confusion has been introduced into a large number of records of the great earthquake of 1897, and urges that the hour zone system be adopted to the exclusion of all others.

In this connection, the Editor would repeat what he has had occasion to say before, namely, that telegraphs, telephones, and first-class clocks and watches are now so universal that it is easy to get standard Greenwich time at any locality and to any degree of accuracy, but not so easy to get local astronomical mean time. The irregularities in the records due to errors in defining what time is actually used by any observer are now much more important to students of meteorology, seismology, terrestrial magnetism, and auroras than in former times, since we now have so many more observers and strive after greater accuracy in the results. There are a few problems in which the consideration of local mean time is important; for such study the records kept on the Greenwich hour standards can easily be converted into mean time records by the student himself. But in many other most important respects, standard Greenwich time itself is both convenient to the observer and essential to the investigator. The advantages of adopting the local Greenwich time and day for ll studies of atmospheric storms and changes outweigh the disadvantages.

The change to one standard from a hundred different local or quasi-local times which began in October, 1884, was resisted by many for fear it would make the sun set a little too early or change the hours of work and meals. Similar objections were made two hundred years ago, when mean time clocks began to supersede the sun dial and the gnomon. In fact, the English common law still requires that noon shall be noon by the sun, which may be fourteen minutes later than mean noon in February, or four minutes earlier in May, or six minutes later in July, or sixteen minutes earlier in November. Now, however, these unnecessarily conservative and antiquated objections are replaced by the conviction that so long as their watches all agree the people of a given region will know exactly what is meant when a given hour is mentioned, and this precision and uniformity is worth everything to a civilized community.

With the spread of ocean cables and the daily presentation of news from a hundred places scattered over the whole globe, it is now necessary for us to contemplate the next step in the use of standard time by the civilized world. Every one daily finds himself figuring out whether a certain event occurring in the Philippines at 10 a. m. happened this morning or yesterday morning. Our international commercial intercourse will become precise only when we adopt Greenwich dates and Greenwich time throughout the world. This improvement, conducing as it does to the transaction of daily business, will not injure but rather be helpful to meteorology. No one has ever attempted to plot upon an ocean chart the observations of a storm by a hundred vessels at sea, but has found inextricable difficulty with records that are kept by the rules of the ancient navigators; the trouble is with the date of the month and day of the week. The modern navigator and the modern business man will do well to think, speak, and write of Greenwich days and dates only, if he would attain precision in current history.

THE ETHER AND THE ATMOSPHERE.

A correspondent proposes the following theory as to the cause of atmospheric changes:

> I have a camphor barometer hermetically sealed so that the air can not directly produce any changes within the liquid. It frequently indicates weather changes thirty-six hours in advance. This has led me to suppose that atmospheric changes are due, primarily, to the action of the ether, as ether waves alone could penetrate the glass to the liquid within the sealed up tube. Kindly state whether our knowledge of the relations that ether waves bear to our atmosphere render such an hypothesis tenable?

The following is quoted from the Editor's reply:

> The Weather Bureau does not generally commit itself to any theory as to the ultimate causes of meteorological phenomena. We speak of the heat received from the sun as the cause of the warmth of the ground and air and of evaporation and all resulting atmospheric disturbances. We recognize the fact that the light and heat can not come from the sun to the earth without the intervention of the ether of space, which is merely the carrier, and would have no appreciable influence if the sun did not set it in motion. Physicists tell us that everything done by ponderable atoms and molecules is due to the action of the ether forcing them hither and thither. But these questions belong to the study of molecules and not to the study of meteorology as such.

It is evident that in the present state of meteorology the action of solar radiation on the atmosphere is so complex that for aught we know all observed meteorological phenomena result from this one source of disturbance, and until we have completely explored this main subject, we have no reason to abandon this study and call upon new hypotheses to help us.

FROM HONOLULU TO IOWA.

Under date of June 7, Mr. Curtis J. Lyons writes to the Editor, from Honolulu:

> I am of the opinion that the electric storm and tornado area which prevailed with you on May 28, passed here on the 18th.

Probably many outside of America have an exaggerated idea of the extent and meteorological importance of the tornadoes to which Mr. Lyons refers. On the 28th and 29th thunderstorms were certainly more numerous over the United States, as a whole, than on the other dates of the month, and yet, both the 2d and the 31st were nearly as conspicuous. Three groups of tornadoes formed along the ninety-ninth meridian on the 27th, about 6 o'clock p. m., central time, and moved eastward. Similarly, on the 28th, small tornadoes occurred in Iowa. On the 29th a squall in Buffalo; on the 30th, tornadoes in South Dakota, Nebraska, Missouri, and Iowa, the latter passing eastward into Illinois.

If we think of the 27th–31st as a period during which there prevailed in the United States an area of thunderstorms and tornadoes that had occupied ten days in moving eastward from the Sandwich Islands, then we must, of course, expect these disturbances to have been observed, or at least felt, at some intermediate point, otherwise we should have no reason whatever to connect these two distant localities together. Now, the fact is that the daily weather maps, the reports of the various State sections for the month of May, the reports of vessels from the ocean, and the daily newspapers agree in showing no special frequency of thunderstorms, tornadoes, waterspouts, auroras, or any other atmospheric disturbances over the whole tract of 70° in longitude, or 4,000 miles, between the Sandwich Islands and the Mississippi Valley. We must, therefore, for the present, withhold acquiescence in the conclusion expressed by our distinguished correspondent. An examination of the Honolulu record for May shows that an area of low pressure existed near that region on the 18th. It probably passed westward, in accordance with the usual movements in this part of the Pacific, and could, therefore, hardly be expected to reach the Mississippi Valley in ten days. If, however, it was not a well-defined cyclonic system, but simply the western end of a long trough of low pressure, then, indeed, the disturbances at Honolulu and in the Mississippi Valley might be due to the same ultimate cause, although neither one produced the other.

We believe most firmly that the weather in any one part of the world depends in part upon what is transpiring in distant regions. A hurricane in the West Indies and cool northerly winds over the Atlantic States; a cold wave in Florida preceded by a blizzard in Montana; drought in Great Britain, preceded by droughts in the United States, and these preceded by droughts in India, are cases in point. The precise nature or mechanics of these connections will be unravelled as meteorology advances. We hope that Mr. Lyons will communicate to the MONTHLY WEATHER REVIEW some account of his studies on this subject.

DO LOCAL STORMS FOLLOW RIVER VALLEYS?

Dr. Samuel D. Irwin, of Tionesta, Forest County, Pennsylvania, under date of July 27, communicates the following case:

One of the heaviest rainfalls for many years occurred here on Tuesday night, 25th inst., between 7 p. m. and 12 o'clock, there being a fall in five hours of 8 inches, according to others of 7.50 inches, but most who observed put it at 8 inches. This rain was local in its character. It washed out streets and alleys on the side hill and caused much damage.

There was but little thunder and lightning. The next day, Wednesday, was "as clear as a bell," as well as to-day, with the exception of a few floating clouds early in the morning. On the 26th of June there was also a very heavy dash of rain in the forenoon about 10 o'clock which lasted nearly an hour and a half, it seemed to pour down, many thought it was a cloudburst, which is an indefinite term; the oldest inhabitant never knew it to rain so hard for so short a time in this section, the rainfall on that day was 5 inches, much like this last rain in character, accompanied by but little thunder and lightning. One remarkable feature of this June rain was that it did not cover a belt of over 6 miles north and south of Tionesta Borough, as was ascertained, it did much damage to roads and bridges, causing washouts of three small bridges on one road alone.

At this place, Tionesta Creek, a considerable stream joins the Allegheny River, coming in directly east, while the general course of the river is from north to south, which in the opinion of some seems to verify the theory that the rain clouds follow the streams to a considerable extent, at least this seems to be the case in the whole extent of the upper Mississippi valley.

Can the further progress of this storm be traced so as to show whether the part here described was but a fragment of its whole history? Can other localities of frequent local rains be found in Pennsylvania? Do not the local rains form rivers and valleys rather than the valleys attract the rains?—ED.

WEATHER BUREAU MEN AS UNIVERSITY LECTURERS.

In continuation of our remarks in the MONTHLY WEATHER REVIEW for June, (page 256), the Editor desires to put on record all that is being done by Weather Bureau officials in the way of lectures and instruction in colleges and universities in the departments of climatology and dynamic meteorology. The following items will show the thoroughness with which some of our co-laborers present these subjects to their students.

Mr. J. Warren Smith, B. S. (Dartmouth, 1888), Section Director, United States Weather Bureau, Columbus, Ohio, delivered a short course in meteorology at the State University, Columbus, Ohio, on Tuesdays and Thursdays during the spring term of ten weeks beginning March 29, 1899. This course was obligatory for the junior class in agriculture and horticulture, but was elective for the students in the college of arts, philosophy, and science. A fee of $5 was paid to the University. The daily weather maps and Davis' Elementary Meteorology were used as text-books. A question box formed an important part of the laboratory equipment. The same course will be given during the winter of 1899–1900 at the request of the trustees of the university.

The object of this course is to open and outline a rational and systematic line of study of the leading facts concerning our atmosphere, of the methods of observing and investigating the daily weather changes, and of the physical laws underlying these changes; thus training the student in scientific methods of investigation, and furnishing the foundation for later studies in advanced meteorology. To encourage the study of the daily weather maps, and to familiarize the student with the work and the reports of the United States Weather Bureau; that he may become more fitted for appointment in the Weather Bureau, or, in private life, may reap more practical benefits from this important branch of the Government service.

Outline of the course.—The actual weather conditions, as found on the weather maps, will be studied from day to day with the theories for these occurrences, the problems found there, and the correlation of the different weather elements as presented in the different parts of our country. An intelligent use of the weather maps for personal weather prediction, with some of the problems presented to the forecaster, will be shown. Weather Bureau instruments will be put in use; and actual and accurate observing, reducing and recording of the different weather elements will be a part of the regular work. Practical work in map and chart making will be carried on.

In the text-book the general relations of the atmosphere and its extent and arrangement about the earth will be first taken up. Then the effect of solar radiation upon atmospheric temperatures, with the distribution of insolation over the earth, conduction and convection in the atmosphere, reflection, absorption, radiation, inversions of temperature, etc., will be considered; to be closely followed by a discussion of the measurement and distribution of atmospheric temperatures over the earth, with the description of the instrument used, and isothermal charts of the earth and of the different countries. One lesson will be given upon the colors of the sky, with the problems of such colors, and upon the atmospheric phenomena of halos, parhelia, etc., in their relation to the probable weather changes, before entering upon the much more complicated discussion of the pressure and circulation of the atmosphere, the general classification of the wind, etc. Under the head of The Moisture of the Atmosphere will be considered evaporation, latent heat, absolute and relative humidity, the formation of

clouds, dew, and frost, prediction of frost, and the protection from frost. The cause, formation, and forward movement of the cyclonic and anticyclonic areas, and of local thunder and hail storms, and of the more severe tornadoes, as they appear on the daily weather maps, will be carefully studied in this part of the course. Attention will then be turned to the causes and distribution of rainfall. The relations between rainfall and agriculture, rainfall and forests, migration of rain belts, and the effect of clouds and rainfall on the general circulation of the atmosphere will be touched upon. The study of the weather and climate, particularly of the United States, will close the course.

Dr. Isaac M. Cline, M. A., M. D., Ph. D., Local Forecast Official and Section Director in the Weather Bureau, is lecturer on climatology in the University of Texas. The course in medical climatology was delivered by him during the winter of 1898–99 weekly to the fourth year students.

The course embraced briefly a description of instruments and methods used in determining climatic conditions and changes; the origin of the atmosphere, its evolution, composition, and offices together with its extent and spherical arrangement; the control of atmospheric temperatures, radiation, insolation, absorption, transmission, conduction and reflection, with particular reference to the manner in which local conditions influence these in making differences in climate; the distribution of temperatures over land and water; the pressure and general wind movements and the ways in which they influence general and local climate; the moisture of the atmosphere, absolute and relative humidity, and sensible temperature of the atmosphere; clouds and sunshine and their distribution; the causes of distribution of precipitation; weather and the control of weather changes, with generalizations as to weather forecasting. Then was taken up the manner in which weather changes and different conditions of climate influence the physiological functions of different organs of the body; the divisions of climates based upon these effects into "low, damp, warm climate," low, damp, cold climate," "high, dry, climate," and intermediate grades; the mineral springs; topographic features and distribution of climate in the United States; the relation of climate to pathology and its influence in the distribution of the more important classes of diseases. Charts and diagrams were used where practicable to illustrate the more important features of the lectures.

Dr. O. L. Fassig, Ph. D., (Johns Hopkins University, 1899), has been instructor in climatology in the department of geology since 1896. His course during the year 1897–98 was twice weekly for two months:

In this course of lectures the topics chiefly considered were: Heat and its distribution over the earth's surface; rainfall and evaporation, their distribution and effects; winds and storms; weather sequences as illustrated by the daily weather charts of the United States Weather Bureau; extent to which topography influences the distribution of the climatic elements; variability of climates; organization and methods in statistical meteorology.

There was also two weeks of field work by the students in a meteorological camp occupied by them in the spring of 1898 in western Maryland.

During the year 1898–99 the following lectures were given, being intended especially for students in geology, medicine, and physics: I. The scope and aim of climatology; the earth's atmosphere; climatic factors. II. Solar radiation. III. The distribution of temperature at the earth's surface. IV. The distribution of atmospheric pressure and the resulting movements of the atmosphere. V. Storms. VI. The moisture of the atmosphere; its visible forms as cloud, rain, snow, dew, fog, etc. VII. Rainfall and its distribution at the earth's surface. VIII. Climates with special reference to the climate of the United States. IX. The daily weather chart. X. Forecasting the weather. XI. The movements of ocean waters and their influence upon climates. XII. Variations in climate, periodic and secular.

During the coming college year, 1899–1900, Dr. Fassig's course will embrace twenty or more lectures on the various aspects of climatology.

The fact that Harvard University accepts an examination in elementary meteorology with original note books of observations and laboratory work as one of the items for admission to Harvard College and the Lawrence Scientific School and as preparatory to higher work in meteorology within the University itself, must greatly stimulate high schools and academies to introduce this subject in their own course of study. An admirable pamphlet of sixteen pages has been published by that University, giving in detail the elementary course of instruction that should be pursued at such academies and further information may be obtained from Mr. R. deC. Ward, Cambridge, Mass.

At some future time the Editor hopes to summarize the instruction given in meteorology by those who are *not* officials of the Weather Bureau.

THE WEATHER AND THE DAIRY.

In the August report of the Virginia Section Mr. E. A. Evans collects together what little is known with reference to the relation of cold weather to the quantity and quality of the milk given by cows. It appears that in general there is a decided diminution in the cream as soon as the weather turns cold, thus justifying the practice of dairymen in keeping the barns artificially heated during cold weather. An interesting case is quoted by Mr. Evans from his own experience in northern Minnesota, in which, although the barn was not artificially heated, yet the cow gave an abundance of rich milk because the ration that was fed to her every evening was hot instead of cold; otherwise the quality and quantity were the same as those given to other cattle.

BALL LIGHTNING.

In the August report of the Utah Section Mr. L. H. Murdoch publishes an account of lightning phenomena that occurred in Salt Lake City in the yard of Senator J. L. Rawlins in Salt Lake City on August 4. This ball is said to have first appeared to be about a foot in diameter, of a ruby red color, entering an open window on the north side of the house. It passed across the hall into the sitting room and out of an open south window, bending and twisting the shrubbery in front of the latter. It then passed southward, tearing up some sod in the yard, and struck a poplar tree about 50 feet distant. The south side of the tree was torn and shattered.

In the usual typical cases of ball lightning very little destruction is reported. The whole phenomenon seems to be confined to the atmosphere and the luminous ball rolls along very slowly. In the present case the tearing up of the sod in the yard and the injury to the poplar tree suggests that after all this may have been only an ordinary discharge of lightning. The doubt would be entirely removed if the observer had stated how many seconds were occupied by the ball in passing from the north side of the house through the latter to the poplar tree.

In the August report of the Maryland and Delaware Section Mr. F. J. Walz publishes a case of ball lightning described by Dr. Stokes, but there is no clear evidence that this differed essentially from an ordinary discharge of lightning.

In former times English writers frequently spoke of a bolt of lightning, or a lightning bolt. This is a figurative expression rather than a descriptive one, and apparently refers to the suddenness of the occurrence. Possibly our observers

are liable to inadvertently speak of a ball of lightning when they intend to speak of a bolt.

In his August report, Mr. J. Warren Smith gives a diagram illustrating a new feature in lightning flashes, as described by Mr. E. W. Dimock, Voluntary Observer at Dupont, Ohio:

When the flash occurred it divided at an altitude of about 20° above the horizon and from the junction of the two branches a bright red ball descended perpendicularly and slowly until lost to sight. A sharp clap of thunder followed in about four seconds.

FILLET OR RIBBON LIGHTNING.

Mr. J. Nelson Trask, under date of September 22 states that at New Salem, Franklin County, Mass., on September 2, 1898, he recorded a ribbon flash, which he calls a fillet flash, different from anything he had seen before. From among the many details given by him, relative to the thunderstorm of that afternoon we quote the following:

I never saw so many flashes shooting horizontally, slanting, or crooked, branched and filleted. The fillet was very curious, it fell sloping with short bright and dark bands alternating, like those of a stepping waterfall.

The zig-zag band sketched by Mr. Trask with its alternate bright and dark spaces would perhaps, if it had been photographed from nature, have appeared as simply one variety of twisted ribbons that are so well known. But while hazarding this conjecture, the Editor must acknowledge that if the zigzag fillet really preserved its full width throughout and was built up of alternate bright and dark portions, as drawn by Mr. Trask, then we certainly have an entirely new type of lightning flash.

DISTANT LIGHTNING.

On Monday, September 4, a flash of lightning that seemed to have occurred over Salt Lake City, Utah, appears also to have been observed by Mr. James Clove, editor of the Provost Enquirer, who was at that time traveling in Piute County, 200 miles south of Salt Lake. Mr. Clove observed at 4:20 p. m. a most vivid flash of lightning among the dark clouds of the north. It seemed near by, but no thunder was heard. Piute is about 2,000 feet higher than Salt Lake City, and Mr. Clove asks whether it could possibly be that the flash witnessed by him was that which did so much damage in the latter city.

As Mr. Clove saw his lightning among the lower dark clouds of the north and as such clouds can not be seen many miles away, it is evident that this flash is not likely to have been identical with that over Salt Lake City. Even if the dark clouds that he saw comparatively near him had been absent, leaving only ordinary clear air between his station and Salt Lake City, still it is not likely that a flash over the latter city would have been visible as a vivid flash at Piute, since the brightest sunshine reflected from a mirror and observed with a large telescope can not be seen through 200 miles of dry dusty air. Flashes of sunlight are often sent as signals from one mountain top to another at a very great distance, but in such cases both observers must be on mountains so that the flash need not pass through the dusty air of the lowlands.

On the other hand, the lightning of an ordinary thunderstorm frequently illuminates the hazy and dusty air up to a height of several thousand feet and to a horizontal distance of many miles, so that an observer 200 miles away may detect the presence of a distant thunderstorm by the flashes known as heat lightning that are seen in the distant clouds above the horizon. But these flashes do not correspond to to the vivid flash among the clouds described by Mr. Clove.

If several observers 50 or 100 miles apart should keep a complete list of the exact bearing of every appearance of distant heat lightning and should draw the proper lines upon a map the intersections of these lines would, undoubtedly, give the exact locations of the storms themselves and thus contribute to complete our history of local thunderstorms.

Owing to the curvature of the earth and the refraction of the rays of light passing through the atmosphere, a point that to an observer at sea level appears to be exactly in the horizon, viz, 90° from the zenith, can not be on the earth's surface, but must be some distance above it. If the point is twenty miles away, it will be about 228 feet above sea level and if it is 200 miles away, it will be nearly 23,000 feet above sea-level. Its elevation in order to appear in the horizontal plane of the distant observer, is calculated by the rule that the elevation in feet is 0.571714 times the square of the distance in miles.

THE STORMS OF AUGUST 2.

A series of local destructive storms occurred on Wednesday, August 2, in several States from New York to Virginia. So far as the State of Maryland is concerned, Mr. F. J. Walz made an exhaustive collection of data and has published an excellent summary in the August report of the Maryland and Delaware sections. Although generally called a thunderstorm, yet many of the conditions peculiar to tornadoes were observed. Some observers noted a funnel shaped cloud formation, others heard the loud and continuous roaring sound, while at many points in Montgomery, Calvert, and St. Mary's counties the winds were tornadic in their nature. Mr. Walz's chart of greatest destruction by wind seems to show that we have to do with a series of local gusts and whirls rather than a single tornado. He says:

The weather chart of 8 a. m., August 2, renders the inference admissible that a secondary depression was formed in the area between Washington, D. C., Lynchburg, Va., Pittsburg, Pa., and Parkersburg, W. Va., and that the winds at each of these stations blew toward the center of this incipient cyclone, which by 3 p. m. had moved eastward to the region of greatest devastation.

The Editor, however, would suggest as equally plausible the following modification of this view. The westerly winds that cross the Alleghany and Blue Ridge blow down over the coastal plain from Virginia to New Jersey in such a way in the afternoon as to underrun and mix with the warmer and moister air that at that time of day overlies the lowlands. When this diurnal phenomenon is intensified by the cooperation of a properly located area of low pressure it invariably leads to the formation of large clouds and often a long series of local storms between 1 p. m. and 9 p. m. along the line of mixtures and ascensions. The atmospheric conditions may be such as to give rise to severe gusts of wind and possibly rain, hail, and lightning. Many such local storms may be in progress simultaneously; they may begin either at the northern or the southern end of the line. Each may move nearly parallel to its neighbors and toward the northeast or the southeast. Each is liable to be so small that we get observations of it from only one or two stations. Occasionally one or two of these storms will have tornadic severity and characteristics, others will be simply ordinary thunderstorms. It would be safer to look for such a series of storms rather than to attempt to explain all the observed phenomena of August 2 as due to one incipient cyclone.

The barometric oscillations during the passage of these storms of August 2 were quite remarkable and have been studied by Mr. H. H. Kimball in an article published in the current number of the Weather Review. He confirms Prof. W. M. Davis's idea that the sudden rise of the barometer is largely due not to wind or rain or density of descending air, but to the rapid expansion of moist air in the process of

forming cumulus clouds. (Davis's Elementary Meteorology, page 263.)

AIR CURRENTS IN THUNDERSTORMS.

It is well known that in general a thundercloud is fed by currents of air flowing toward its center with a gentle ascending gradient that becomes very steep within the cloud itself. But the descending rain both by cooling the air through which it falls and by driving it downward, causes an outward wind near the ground and near the center of the thunderstorm. On August 5 Mr. Wm. A. Eddy, of Bayonne, N. J., sent up a small hot-air balloon at 4:15 p. m. as a heavy thunderstorm was approaching. After ascending vertically for 100 feet it was caught in the current that swept it toward the center of the storm and at the same time it rose until it was fully 2,000 feet above the earth and finally penetrated the cloud with falling rain. It was then driven downward and backward until it reached a point on the earth quite near its starting point. Two other similar experiments with the same results had been made by Mr. Eddy on July 22 and 27.

This is an interesting method of studying the currents of air in the atmosphere. It may not be wholly new, but is well worthy of frequent repetition.

ANCIENT TORNADO TRACKS.

In the August report of the Iowa Monthly Review, Messrs. Sage and Chappel reprint from the Davenport Democrat some account of several tornadoes that must have occurred years ago, whose existence and tracks are demonstrated by long lines of destruction in forests. Such tornado tracks were frequently investigated by Lieut. John P. Finley and included in his tables of tornadoes. The additional ones now recorded are as follows:

Several located by Mr. James E. Lindsay, of Davenport, and E. W. Durant, of Stillwater, in the neighborhood of Davenport. Also, several located by Lindsay in northwestern Wisconsin and Nebraska. The Comanche tornado of 1860. The tornado of Cedar County, June 5, 1854, located by Joseph Wright of Plato, Iowa, who says:

> The path of the storm was half a mile wide as it cut its way through the timber. Everything was taken clean—nothing left. When the storm crossed Cedar River it took large stones from the bottom and carried them on land. From the best information I could gather, this storm of 1854 must have reached Lake Erie.

There is no reason whatever to imagine that the tornado is a new phenomenon. It must have been just as common in North America 5,000 years ago as it is to-day. Every well-marked ancient tornado path that can still be recognized in the fallen timber, or a description of which can be obtained from ancient letters, newspapers, or local records should be put on record.

BACK NUMBERS OF THE MONTHLY WEATHER REVIEW.

The Smithsonian Institution desires two copies each of the MONTHLY WEATHER REVIEW for September, 1897, and September, 1898.

The Public Library at Sydney, New South Wales, desires a copy of the MONTHLY WEATHER REVIEW for November, 1895.

The Meteorological Observatory at Bremen, Germany, desires to obtain the complete years 1897 and 1898.

In general, it is best for those having copies to spare of the MONTHLY WEATHER REVIEW to send them to the Editor of the REVIEW and not to the person for whom the request is made, as in the latter case unnecessary duplicates accumulate on his hands.

THE SECOND WELLMAN EXPEDITION.

Mr. Evelyn B. Baldwin, of the Weather Bureau, who was granted a furlough to enable him to accompany the second Wellman expedition in the capacity of meteorologist, has very recently returned from Franz-Josef Land, and has resumed his duties in the Weather Bureau.

We are authorized by Professor Moore to announce that a report on the meteorological work of the expedition is now in course of preparation and that it will be published shortly by the Weather Bureau.

The region covered by the expedition was mainly between latitude 80° 05′ and 81° 20′ north and longitude 58° to 64° east. The report will include, in addition to hourly barograph and thermograph readings, twice daily eye observations of the clouds, as to amount, kind, and direction; wind movement by Robinson anemometer; observations of the aurora, and other natural phenomena.

Typical pressure and temperature curves, as well as those made during times of unusual atmospheric disturbances, will be reproduced in full. The material collected by Mr. Baldwin is not only interesting and valuable in itself, but also in its relation to the work of former expeditions, since it forms a connecting link between that of Dr. Blessing and Lieutenant Johannsen of the Nansen expedition, as well as that of the Jackson-Harmsworth expedition and work now being prosecuted in Franz-Joseph Land by the Italian expedition under command of Prince Luigi, duc d'Arbruzzi. His aurora work was complementary to that done by himself on the Peary expedition of 1893–94 in Greenland.—*A. J. H.*

A SUCCESSOR TO SENOR BARCENA.

The President of the Republic of Mexico has appointed Manuel E. Pastrana director of the Central Meteorologico-Magnetic Observatory at the City of Mexico as successor to the late Don Mariano Bárcena. The climatology of the Republic is committed to this Central Observatory, but the daily weather telegraphy, maps, and predictions are conducted by the Federal Department of Telegraphs. The stations of the latter organization are new and are in the telegraph offices and convenient to the business men of the Republic, but those of the Central Observatory represent the agricultural and educational interests.

THE WEATHER OF THE MONTH.

By ALFRED J. HENRY, Chief of Division of Records and Meteorological Data.

PRESSURE.

The distribution of monthly mean pressure is graphically shown on Chart IV. The persistence of a West India hurricane off the coast of North Carolina, and the very low barometer readings during the prevalence of the storm explain the unusually low monthly means along the south Atlantic coast. Ordinarily pressure in August is highest on the south Atlantic and north Pacific coasts.

There was a very general decrease in pressure from July to

August, not only on the south Atlantic coast, but also thence northwestward to the north Pacific coast. Pressure rose in the St. Lawrence Valley, but elsewhere except in portions of of California and Nevada there was a general fall.

TEMPERATURE OF THE AIR.

The distribution of monthly mean surface temperatures is shown on Chart VI which also shows by appropriate lines the monthly maximum and minimum temperatures. The distribution of monthly mean temperatures was rather abnormal. West of a line drawn from central North Dakota through the center of Arizona, temperature was much below the seasonal normal, while east of the same line, temperature was considerably above the seasonal normal, particularly in northern Texas, Oklahoma, and portions of Kansas and Missouri. The writer does not remember having seen a similar distribution during the last five years.

Maximum temperatures ranging from 100° to 110° in the shade were rather frequently observed in the Southwest, viz: Oklahoma, Texas, New Mexico, and Arizona. Maximum temperatures of 100° and over also occurred in the Gulf States, east of the Mississippi; in South Dakota and elsewhere, as may be seen by an examination of Chart VI. Freezing temperatures occurred in the plateau and mountain regions of northern Nevada, southeastern Idaho, and in northern North Dakota.

In Canada.—Prof. R. F. Stupart says:

The temperature was below average from Vancouver Island to the Qu'Appelle Valley, and above average everywhere else in the Dominion, except over Cape Breton and the Island of Anticosti, where it was from average to over 1° below. In British Columbia and the Northwest Territories it was very much below average, Kamloops reporting as much as 8° below, and Banff and Calgary 6° below. On the other hand, many places in Ontario report the temperature as much as 5° above average, and in the Province of Quebec, Montreal was 3° above, and Quebec City 2° above average.

Average temperatures and departures from the normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
		°	°	°	°
New England	10	67.1	− 0.2	+ 1.1	+ 0.1
Middle Atlantic	12	74.3	+ 1.1	− 0.9	− 0.1
South Atlantic	10	80.6	+ 2.2	+ 0.1	0.0
Florida Peninsula	7	82.4	+ 1.3	+ 2.1	+ 0.3
East Gulf	7	81.8	+ 2.0	− 3.5	− 0.4
West Gulf	7	84.2	+ 3.5	− 2.5	− 0.3
Ohio Valley and Tennessee	12	78.0	+ 3.2	− 0.5	− 0.1
Lower Lake	8	71.7	+ 2.2	+ 3.8	+ 0.5
Upper Lake	9	68.2	+ 2.5	− 3.2	− 0.4
North Dakota	7	65.7	− 0.2	−19.2	− 2.4
Upper Mississippi	11	75.9	+ 3.1	− 6.3	− 0.8
Missouri Valley	10	76.6	+ 3.5	− 9.0	− 1.1
Northern Slope	7	66.5	− 1.3	−26.1	− 3.3
Middle Slope	6	78.7	+ 4.0	− 8.0	− 1.0
Southern Slope	6	83.1	+ 5.7	−10.1	− 1.3
Southern Plateau	13	76.9	− 2.4	− 8.2	− 1.0
Middle Plateau	9	65.7	− 4.7	−13.8	− 1.7
Northern Plateau	10	62.0	− 6.8	−17.2	− 2.2
North Pacific	9	58.8	− 2.9	−14.0	− 1.8
Middle Pacific	5	62.2	− 2.6	− 4.8	− 0.6
South Pacific	4	68.4	− 3.1	− 4.9	− 0.6

PRECIPITATION.

The distribution of precipitation is exhibited on Chart III. Precipitation was in excess of the normal over the Pacific coast States, the northern Plateau, the middle Plateau, the upper Mississippi Valley, the Lake Superior region, the greater portion of the east Gulf States, central Virginia, and thence northeastward over a narrow strip of country extending to southeastern Pennsylvania. Precipitation was greatly deficient from the New England coast westward to the eastern borders of Wisconsin and also over Texas and the Plains northward to the Canadian boundary. There was also a deficiency of precipitation in North Carolina, and thence westward to the lower Ohio and Mississippi valleys. The geographic extent of regions having an excess of precipitation was about equal to that of those having a deficiency.

The drought that had prevailed in New York and elsewhere in the lower Lake region was broken by copious rains about the 26th. Forest fires broke out in the Adirondacks and other places in central New York toward the end of the droughty period. The timely rains at the close of the month greatly aided the authorities in quenching the fires.

In Canada.—Professor Stupart says:

The rainfall was above average from Vancouver Island to the Qu'Appelle Valley and also over the Lake Superior district, and below average throughout the large remaining portion of Canada. The excessive precipitation over British Columbia and the Northwest Territories was remarkable, and more especially in the Territories, where the average amount of precipitation is usually so small. Calgary reports 9.4 inches, nearly equal to the total average annual amount for that district. Edmonton reports 6.4 inches, and Prince Albert 6.8 inches. It was also remarkable, considering the abnormal rainfall in the Northwest Territories, that Manitoba should have had an amount less than the average when that in the Lake Superior district was also above average. Another remarkable feature in the rainfall distribution during the month was the drought over the Georgian Bay district, the lower Lake region and the Ottawa Valley. Some few localities, owing no doubt to local thunderstorms, recorded over two inches of rain, but over the larger portion of these districts scarcely any fell, and some places reported none.

Average precipitation and departures from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		Inches.		*Inches.*	*Inches.*
New England	10	1.97	50	−2.0	−2.5
Middle Atlantic	12	4.20	91	−0.4	−1.9
South Atlantic	10	6.81	100	0.0	−2.3
Florida Peninsula	7	6.03	91	−0.6	−1.7
East Gulf	7	5.83	104	+0.2	−6.6
West Gulf	7	1.13	31	−2.5	−5.8
Ohio Valley and Tennessee	12	2.76	78	−0.8	−3.1
Lower Lake	8	0.85	29	−2.1	−4.9
Upper Lake	9	2.10	70	−0.9	−2.1
North Dakota	7	2.31	100	0.0	−1.0
Upper Mississippi Valley	11	3.51	117	+0.5	+1.7
Missouri Valley	10	3.45	83	−0.7	−3.7
Northern Slope	7	1.34	100	0.0	−0.1
Middle Slope	6	1.84	70	−0.8	+1.4
Southern Slope	6	0.30	11	−2.5	+2.5
Southern Plateau	9	1.09	68	−0.5	−1.7
Middle Plateau	13	1.19	202	+0.6	+1.3
Northern Plateau	10	1.29	331	+0.9	−0.6
North Pacific	9	2.61	287	+1.7	+5.2
Middle Pacific	5	0.27	386	+0.2	−1.7
South Pacific	4	0.02	100	0.0	−1.7

HAIL.

The following are the dates on which hail fell in the respective States:

Alabama, 13. Arizona, 15, 28, 31. Arkansas, 13, 17, 25. California, 4, 6, 7, 17. Colorado, 2, 3, 5, 6, 13, 14, 16, 17. District of Columbia, 2. Idaho, 8, 13, 20. Illinois, 11, 12, 27. Indiana, 5, 11, 12, 25, 28. Iowa, 1, 9, 11, 18, 23. Kansas, 4, 9, 10, 11, 14, 17, 25, 26. Kentucky, 11, 12, 13, 26. Louisiana, 2, 13, 14, 15, 29. Maryland, 2, 10, 11, 14, 21, 22, 26, 27. Michigan, 11. Minnesota, 10, 11, 31. Mississippi, 1, 25, 28. Missouri, 5, 12, 18, 26, 27. Montana, 5, 7, 10. Nebraska, 1, 2, 3, 9, 10, 12, 13, 16, 18, 19, 26, 29. Nevada, 3, 4, 6. New Jersey, 2, 21. New Mexico, 2, 14. New York, 2, 12, 21, 25, 26. North Carolina, 1, 11, 22. North Dakota, 1, 9, 17, 28. Ohio, 2, 5, 11, 12, 21, 25, 26. Oklahoma, 14. Oregon, 13, 20, 21, 28. Pennsylvania, 2, 10, 11, 12, 21, 25, 26, 27. South Carolina, 11, 12, 21, 23, 24, 25, 26. South Dakota, 1, 10, 17, 18, 30. Tennessee, 13, 26. Texas, 31. Utah, 16, 30. Virginia, 2, 11, 26. Washington, 9. West Virginia, 2, 12, 27. Wisconsin, 1, 9, 10, 11, 23. Wyoming, 7, 9, 13, 16, 19, 28.

LOCAL STORMS AND TORNADOES.

The month was quite free from destructive tornadoes. Local windstorms of more or less severity occurred in various sections of the country.

A violent local storm of wind and rain, having some of the characteristics of a hurricane, struck the Florida coast about 25 miles east of Apalachicola. Great damage was done to the shipping in the harbor and the buildings on land. At Carrabelle fourteen barks were wrecked and a large number of smaller craft destroyed. Six persons lost their lives.

According to Mr. A. J. Mitchell, Section Director, Florida Climate and Crop Service, the diameter of the storm was not more than 40 miles and its force was expended before it had progressed 50 miles inland. Storms of this character on the Gulf coast are not as infrequent as might be supposed although it rarely happens that so much violence is concentrated along such a short path.

The violent thunderstorms of August 2 in New York, New Jersey, eastern Pennsylvania, Delaware, Maryland, and the District of Columbia were made the subject of a special article which appears elsewhere in this REVIEW.

A series of violent thunderstorms swept across the northern part of Illinois during the afternoon and evening of the 11th.

Mr. C. E. Linney, Section Director, Climate and Crop Service of Illinois, in a communication to the Central Office, says:

> The storm seems to have advanced across Illinois at the rate of more than 45 miles per hour, crossing the State from Scales Mound to Chicago, 153 miles, in three hours and fifteen minutes. In its path much damage was done, although the damage at any one point was comparatively small. Rockford seems to have suffered most. Three lives were lost by lightning during the storm; one at Janesville, Wis.; one at Harvard, Ill., and another in Chicago, Ill. No reasonable estimate can be made of the loss or damage to property, but the reports of loss by lightning thus far received aggregate more than $9,000 and this amount is probably but a small part of the loss actually sustained.

On the evening of the 19th a number of severe local storms swept over portions of Hamlin, Deuel and Brookings counties, S. Dak. One life was lost and many buildings were so damaged as to be unfit for habitation. Probably a half dozen houses and as many more barns and outbuildings were destroyed. Much grain in the shock was damaged by the rain and wind.

An incipient tornado wrecked a house 3 miles east of Gleason, Tenn., on the 26th, killing one man and injuring two others. The funnel cloud did not touch the earth again.

One hundred and thirty lives were lost by lightning during the current month. This is the greatest number of fatal cases of lightning stroke in a single month ever before reported.

WIND.

The maximum wind velocity at each Weather Bureau station for a period of five minutes is given in Table I, which also gives the altitude of Weather Bureau anemometers above ground.

Following are the velocities of 50 miles and over per hour registered during the month:

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Amarillo, Tex	13	54	n.	Jupiter, Fla	13	52	n.
Basseterre, St. Kitts	7	72	ne.	Little Rock, Ark	25	60	nw.
Cape Henry, Va	16	50	ne.	Louisville, Ky	12	50	n.
Do	17	66	ne.	Mount Tamalpais, Cal.	7	50	nw.
Do	18	54	ne.	Do	14	61	n.
Do	19	60	ne.	Do	16	67	nw.
Cape May, N. J	6	56	w.	Do	20	91	nw.
Charleston, S. C	15	57	ne.	Do	21	71	nw.
Chicago, Ill	11	54	nw.	Do	26	88	n.
Fort Canby, Wash	9	50	se.	Do	27	64	nw.
Hatteras, N. C	16	54	ne.	New York, N. Y	5	64	nw.
Do	17	*	n.	San Juan, Porto Rico	8	66	e.
Do	18	70	se.	Sioux City, Iowa	2	59	nw.
Do	19	50	sw.				

*Anemometer cups blown away; estimated velocity 105 miles.

HUMIDITY.

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
	%			%	
New England	82	0	Missouri Valley	68	+ 1
Middle Atlantic	78	+ 3	Northern Slope	56	+ 5
South Atlantic	80	− 2	Middle Slope	56	− 5
Florida Peninsula	79	− 2	Southern Slope	45	−19
East Gulf	81	+ 1	Southern Plateau	36	−12
West Gulf	71	− 3	Middle Plateau	37	+ 5
Ohio Valley and Tennessee	70	− 1	Northern Plateau	52	+ 9
Lower Lake	67	− 3	North Pacific Coast	79	+ 1
Upper Lake	77	+ 3	Middle Pacific Coast	63	− 5
North Dakota	68	+ 5	South Pacific Coast	67	+ 4
Upper Mississippi	71	+ 1			

SUNSHINE AND CLOUDINESS.

The distribution of sunshine is graphically shown on Chart VII, and the numerical values of average daylight cloudiness, both for individual stations and by geographical districts, appear in Table I.

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	5.5	+0.5	Missouri Valley	4.2	+0.1
Middle Atlantic	5.6	+0.6	Northern Slope	4.2	+0.5
South Atlantic	5.1	−0.1	Middle Slope	2.8	−1.0
Florida Peninsula	5.0	−0.2	Southern Slope	1.2	−3.6
East Gulf	4.3	−0.6	Southern Plateau	2.2	−1.2
West Gulf	2.4	−2.0	Middle Plateau	3.4	+1.2
Ohio Valley and Tennessee	4.1	−0.4	Northern Plateau	4.6	+1.6
Lower Lake	3.5	−1.0	North Pacific Coast	6.7	+2.8
Upper Lake	4.6	−0.2	Middle Pacific Coast	3.8	+1.0
North Dakota	3.8	−0.1	South Pacific Coast	2.4	−0.1
Upper Mississippi	4.4	+0.3			

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table VII, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and

auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—Reports of 4,943 thunderstorms were received during the current month as against 4,853 in 1898 and 5,476 during the preceding month.

The dates on which the number of reports of thunderstorms for the whole country were most numerous were: 2d, 302; 26th, 264; 5th, 250; 4th, 244; 10th, 237.

Reports were most numerous from: Pennsylvania, 240; Missouri, 224; Nebraska, 219; Florida, 218.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz, 16th to 24th.

The greatest number of reports were received for the following dates: 29th, 12; 30th, 6; 3d and 4th, 5.

Reports were most numerous from: Minnesota, 5; Maine, Montana, New York, and Ohio, 4.

In Canada.—Auroras were reported as follows: Father Point, 6th, 9th, 30th; Quebec, 1st, 13th, 20th, 27th; Minnedosa, 4th, 5th, 30th, 31st; Qu'Appelle, 13th; Medicine Hat, 13th, 27th, 29th; Swift Current, 7th; Prince Albert, 3d, 30th.

Thunderstorms were reported as follows: Sydney, 2d, 9th; Halifax, 20th; Grand Manan, 23d; Yarmouth, 22d, 23d, 27th; Charlottetown, 14th, 16th; Father Point, 4th, 5th, 13th; Quebec, 3d, 4th, 5th, 12th, 13th, 22d, 25th, 31st; Montreal, 12th, 21st, 22d; Rockliffe, 21st; Toronto, 2d, 11th; White River, 11th, 20th, 21st, 29th, 30th; Port Stanley, 10th, 11th, 27th; Parry Sound, 2d, 12th; Port Arthur, 11th, 27th, 28th, 29th; Winnipeg, 10th, 19th; Minnedosa, 10th, 16th, 19th, 22d, 23d, 29th; Qu'Appelle, 9th, 19th; Medicine Hat, 6th, 8th, 9th, 10th, 11th, 13th, 22d, 25th; Swift Current, 6th, 8th, 9th, 10th, 15th, 24th, 25th; Calgary, 5th; Banff, 13th; Prince Albert, 13th, 24th; Battleford, 7th, 9th, 15th, 23d; Kamloops, 6th, 13th; Barkerville, 8th, 11th, 14th, 24th, 26th.

NOTES ON THE WEATHER OF THE WEST INDIES.

Chart VIII shows the distribution of pressure and temperature, and the prevailing winds in the West India region for the month, being a continuation of the series begun in the REVIEW for April, 1899.

The hurricane of August 7–10, described elsewhere in this REVIEW and also in Storm Bulletin No. 1, was naturally the overshadowing feature of the weather of the month. A second disturbance occurred over the Caribbean Sea during the closing days of the month, but beyond a few squalls and some threatening weather no serious consequences resulted.

The rainfall was very heavy in Porto Rico in connection with the hurricane that swept over that island. A little over 9 inches of rain fell at Port of Spain, but elsewhere the fall was not heavy. At Havana only 0.14 inch fell during the entire month. Across the island at Cienfuegos 4.44 inches fell, that amount being distributed rather evenly throughout the month.

The greatest number of thunderstorms occurred at Cienfuegos, the observer at that station reporting 21 during the month. At Santiago, on the same side of the island, but 3 thunderstorms occurred, although more rain fell than at Cienfuegos.

Thunderstorms in the West Indies appear to be due almost solely to local causes, such as the breaking up of a condition of unstable equilibrium in the atmosphere and must, therefore, be classed as heat thunderstorms. As such they are not so severe as the cyclonic thunderstorms which occur in the United States.

DESCRIPTION OF TABLES AND CHARTS.

By ALFERD J. HENRY, Chief of Division of Records and Meteorological Data.

For text descriptive of tables and charts see page 317 of REVIEW for July, 1899.

TABLE I.—*Climatological data for Weather Bureau Stations, August, 1899.*

Stations.	Elevation of instruments. Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Pressure, in inches. Mean actual, 8 a. m. and 8 p. m. ÷ 2.	Mean reduced.	Departure from normal.	Temperature of the air, in degrees Fahrenheit. Mean max. and min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.	Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches. Total.	Departure from normal.	Days with .01, or more.	Wind. Total movement, miles.	Prevailing direction.	Maximum velocity. Miles per hour.	Direction.	Date.	Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
New England.							67.1	− 0.2										82	1.97	− 2.0										5.5	
Eastport	76	69	74	29.93	30.02	+ .05	60.8	+ 0.2	80	1	68	49	9	54	25	57	55	85	0.53	− 3.0	3	5,310	sw.	24	e.	24	11	11	9	5.5	
Portland, Me	103	81	89	29.88	29.98	.00	65.5	− 1.3	87	19	72	51	9	58	23	60	56	78	1.66	− 2.1	10	4,477	s.	19	s.	18	10	13	8	5.3	
Northfield	872	15	65	29.10	30.01	+ .03	64.5	+ 1.6	92	21	78	36	9	51	44	59	56	76	0.77	− 3.9	5	5,469	s.	27	nw.	8	13	12	6	4.5	
Boston	125	115	181	29.88	30.01	+ .03	68.8	− 0.3	90	19	76	53	9	61	26	62	59	75	2.52	− 1.9	7	6,064	e.	32	e.	10	9	10	12	5.7	
Nantucket	14	43	54	29.99	30.00	− .01	67.0	− 0.7	82	19	72	57	15	62	18	64	62	89	2.08	− 1.1	7	6,593	ne.	28	se.	11	7	15	9	6.1	
Woods Hole	22	11	57	29.98	30.00	+ .01	69.1	+ 0.9	82	20	75	57	27	63	18	64	63	87	2.91	− 1.0	5	6,382	n.	28	n.	14	5	15	11	6.3	
Vineyard Haven	......	20	55	......	......	......	69.6	− 1.3	84	19	77	51	16	62	25	....	....	....	2.76	− 1.4	4	4,608	s.	22	ne.	28	7	12	12	6.4	
Block Island	27	11	48	29.97	30.00	.00	67.6	− 0.4	80	5	73	49	16	62	22	64	62	86	1.79	− 1.7	4	7,892	ne.	35	ne.	29	13	10	8	4.5	
Narragansett	......	10	....	......	......	......	68.0	− 0.4	83	5	76	48	16	60	28	....	....	....	4.02	+ 0.2	4	......	sw.	......	......	......	19	6	6	......	
New Haven	107	118	140	29.88	29.99	− .02	69.9	− 0.1	88	5	78	50	16	62	29	65	62	79	0.65	− 4.5	6	5,053	ne.	26	s.	2	6	19	6	5.0	
Mid. Atlan. States.							74.3	+ 1.1										73	4.20	− 0.4										5.6	
Albany	97	84	113	29.90	30.01	+ .03	72.3	+ 1.8	93	20	82	50	15	62	32	65	62	74	1.77	− 2.3	8	4,152	s.	30	se.	12	11	8	12	5.7	
Binghamton	875	79	90	......	......	......	69.5	+ 2.3	94	21	82	42	9	57	39	....	....	....	2.44	− 1.6	7	3,458	nw.	20	nw.	21	12	9	10	5.0	
New York	314	313	346	29.67	30.00	− .01	73.6	+ 1.3	91	5	81	60	9	66	21	67	64	79	3.90	− 0.8	8	6,746	ne.	64	nw.	5	6	13	12	5.9	
Harrisburg	377	94	104	......	......	......	74.2	+ 2.1	95	20	84	55	17	65	28	....	....	....	4.85	+ 0.3	9	3,782	e.	31	w.	5	8	17	6	5.5	
Philadelphia	117	168	184	29.87	29.99	− .03	74.8	+ 1.0	95	21	82	58	17	67	24	67	64	74	5.18	+ 0.8	8	6,384	ne.	36	n.	2	7	9	15	6.5	
Atlantic City	52	68	76	29.98	29.98	− .01	71.4	− 0.4	84	5	76	55	15	67	18	69	68	87	5.56	+ 0.8	13	7,474	e.	38	nw.	5	4	19	8	6.1	
Cape May	24	52	70	29.96	29.98	......	72.4	− 0.8	85	20	76	61	8	68	18	69	....	....	2.98	− 2.6	12	8,299	ne.	56	w.	6	8	16	7	5.5	
Baltimore	123	68	82	29.84	29.96	− .05	75.6	+ 0.7	97	20	84	58	17	67	28	68	64	72	4.86	+ 0.8	13	3,948	ne.	20	nw.	13	8	13	10	5.4	
Washington	112	59	76	29.86	29.97	− .05	74.8	+ 0.2	96	20	84	58	17	66	26	69	67	82	3.77	− 0.2	13	3,997	ne.	42	n.	2	8	16	7	5.5	
Cape Henry	......	5	34	......	......	......	77.6	+ 1.2	96	21	83	68	1	72	21	....	....	....	4.91	− 0.6	8	10,572	ne.	66	ne.	17	9	10	12	6.0	
Lynchburg	685	83	88	29.25	29.96	− .05	76.8	+ 1.5	97	5	86	61	17	68	28	69	67	77	7.50	+ 3.5	10	2,328	ne.	24	nw.	6	8	14	9	5.5	
Norfolk	92	102	111	29.84	29.94	− .06	78.5	+ 1.9	99	5	86	66	17	72	22	73	71	83	2.73	− 3.4	10	7,098	ne.	42	ne.	17	14	8	9	4.8	
Richmond	144	98	105	......	......	......	78.0	......	98	5	86	63	29	70	27	....	....	....	5.61	......	10	4,723	n.	25	n.	18	9	15	7	5.4	
S. Atlantic States.							80.6	+ 2.2										80	6.81	0.0										5.1	
Charlotte	773	68	76	29.16	29.95	− .04	79.4	+ 3.3	98	20	89	63	17	69	28	70	67	72	4.98	− 0.4	9	4,274	ne.	25	sw.	10	10	12	9	5.3	
Hatteras	11	17	86	29.89	29.90	− .09	78.4	+ 1.0	89	5	83	69	9	74	14	74	73	86	14.19	+ 7.8	12	10,406	n.	‡	n.	17	12	12	7	5.1	
Kittyhawk	9	12	30	......	......	......	77.0	− 0.6	97	5	82	68	16	72	18	....	....	....	5.75	− 1.1	8	10,098	......	......	......	......	12	12	7	5.3	
Raleigh	375	93	101	29.56	29.94	− .05	78.6	+ 2.9	97	5	87	65	29	70	25	72	70	82	3.37	− 4.6	12	4,165	n.	36	se.	22	7	17	7	5.2	
Wilmington	78	82	90	29.86	29.94	− .05	79.8	+ 1.6	98	4	86	65	17	73	20	74	73	85	5.79	− 1.7	14	6,170	sw.	36	ne.	16	9	11	11	5.8	
Charleston	48	14	92	29.92	29.97	− .02	83.3	+ 2.8	100	4	90	70	17	77	22	76	74	79	8.66	+ 1.0	12	8,523	sw.	57	ne.	15	4	22	5	5.5	
Columbia	......	5	....	......	......	......	82.2	+ 3.6	100	4	93	66	30	72	30	....	....	....	6.28	− 0.6	13	......	ne.	......	......	......	9	15	7	5.2	
Augusta	180	89	108	29.75	29.94	− .03	82.0	+ 2.6	98	4	92	68	29	72	27	73	71	77	6.17	+ 1.0	10	4,355	s.	42	n.	10	12	14	5	4.4	
Savannah	82	63	89	29.86	29.94	− .06	82.9	+ 2.6	100	7	92	67	28	74	25	74	72	79	9.04	+ 1.3	14	6,136	w.	44	ne.	14	10	19	2	4.3	
Jacksonville	43	60	84	29.90	29.95	− .03	82.8	+ 1.7	98	6	92	69	30	74	24	75	73	80	3.90	− 2.6	12	5,370	sw.	32	sw.	8	8	19	4	5.3	
Florida Peninsula.							82.8	+ 0.7										79	4.90	− 1.5										5.0	
Jupiter	28	13	30	29.91	29.94	− .06	81.8	+ 0.8	93	7	88	72	22	75	17	77	75	83	5.96	+ 0.9	11	6,734	s.	52	n.	13	19	8	4	3.8	
Key West	22	43	50	29.94	29.96	.00	84.2	+ 0.3	90	27	88	72	25	80	17	77	75	74	3.80	− 1.0	8	5,993	se.	38	nw.	13	9	21	1	4.7	
Tampa	36	60	67	29.91	29.95	− .02	82.8	+ 0.9	93	23	90	70	29	75	20	76	74	80	4.93	− 4.5	12	4,269	w.	26	w.	14	0	25	6	6.6	
East Gulf States.							81.8	+ 2.0										81	5.83	+ 0.2										4.3	
Atlanta	1,174	139	156	28.76	29.95	− .04	80.0	+ 3.5	96	22	89	63	29	71	24	72	69	77	3.15	− 1.6	10	6,488	nw.	36	w.	25	10	18	3	4.7	
Macon	370	....	....	......	......	......	81.1	......	97	10	91	66	29	71	29	....	....	....	1.94	......	10	4,394	w.	42	ne.	10	6	23	2	5.3	
Pensacola	56	78	90	......	......	......	81.9	+ 1.5	94	1	89	65	31	75	21	....	....	....	10.49	+ 2.1	16	6,086	nw.	44	e.	12	14	13	4	4.4	
Mobile	57	88	96	29.89	29.95	− .02	82.2	+ 1.9	97	8	90	68	13	75	24	76	75	87	4.21	− 2.7	14	4,647	nw.	42	n.	13	22	9	0	2.9	
Montgomery	221	100	112	29.71	29.94	− .04	81.7	+ 1.9	99	12	91	67	29	73	25	75	74	84	7.89	+ 3.8	10	4,035	ne.	34	ne.	12	9	14	8	5.2	
Meridian	375	84	94	......	......	......	80.4	+ 2.6	96	9	90	65	31	71	24	....	....	....	6.45	+ 2.6	10	3,231	sw.	34	e.	21	10	16	5	4.9	
Vicksburg	247	65	73	29.65	29.91	− .08	82.4	+ 2.3	96	22	91	67	30	74	23	75	73	81	4.46	+ 0.9	11	3,823	se.	28	se.	25	16	14	1	3.6	
New Orleans	54	112	120	29.89	29.95	− .01	83.6	+ 2.1	96	1	90	71	30	77	18	75	72	76	2.31	− 3.8	12	4,880	sw.	31	nw.	14	16	14	1	3.5	
Port Eads	......	27	....	......	......	......	81.8	− 0.2	91	*	87	70	*	76	16	....	....	....	7.68	+ 0.1	13	......	w.	36	sw.	20	4	17	10	......	
West Gulf States.							84.2	+ 3.5										71	1.13	− 2.5										2.4	
Shreveport	249	77	84	29.65	29.91	− .06	86.4	+ 5.1	104	9	98	68	18	74	29	73	68	64	0.61	− 1.6	4	3,979	se.	36	e.	27	20	5	6	3.5	
Fort Smith	457	74	82	29.42	29.89	− .05	84.5	+ 6.8	103	11	97	67	31	72	32	72	67	62	1.15	− 2.6	1	3,980	e.	24	n.	14	21	9	1	2.8	
Little Rock	357	93	100	29.55	29.92	− .05	82.4	+ 4.2	100	20	93	67	31	72	30	74	71	73	1.83	− 2.3	5	3,804	ne.	60	nw.	25	17	14	0	2.9	
Corpus Christi	20	42	50	29.89	29.91	− .05	83.1	+ 1.7	92	16	88	75	30	78	16	78	76	83	0.00	− 3.1	0	9,682	se.	31	e.	31	30	1	0	0.6	
Fort Worth	670	106	114	......	......	......	87.0	......	104	20	99	68	31	75	28	....	....	....	0.02	......	1	4,375	sw.	14	se.	17	27	4	0	1.8	
Galveston	54	85	96	29.87	29.92	− .03	83.4	+ 0.2	93	28	88	68	31	79	21	77	75	81	2.52	− 3.0	6	5,606	s.	31	sw.	31	18	9	4	3.7	
Palestine	510	54	61	29.38	29.91	− .06	83.6	+ 3.2	106	23	94	67	31	73	28	74	71	73	1.83	− 0.8	4	4,160	sw.	28	ne.	15	24	6	1	2.8	
San Antonio	704	95	104	29.16	29.88	− .06	85.8	+ 3.6	101	18	98	71	31	74	27	72	65	59	0.00	− 3.8	0	6,018	se.	28	se.	31	31	0	0	1.4	
Ohio Val. & Tenn.							78.0	+ 3.2										70	2.76	− 0.3										4.1	
Chattanooga	762	106	112	29.18	29.96	− .04	80.8	+ 4.9	97	11	91	66	30	70	26	71	67	71	2.39	− 1.4	11	4,254	w.	42	nw.	26	11	17	3	4.1	
Knoxville	1,004	10	88	28.94	29.97	− .05	78.4	+ 3.6	95	25	89	64	18	68	28	70	67	73	1.52	− 2.6	9	3,972	ne.	44	ne.	11	18	10	3	3.0	
Memphis	399	140	154	29.52	29.93	− .05	82.6	+ 3.9	97	13	90	67	27	75	26	74	72	77	2.08	− 1.5	7	3,146	sw.	32	ne.	27	18	8	5	3.9	
Nashville	545	128	134	29.40	29.96	− .02	80.2	+ 2.7	96	11	90	66	25	70	29	71	68	73	2.53	− 0.9	9	3,487	ne.	24	nw.	5	14	13	4	3.9	
Lexington	990	75	102	......	......	......	77.0	+ 3.1	95	3	86	59	8	67	28	....	....	....	4.18	+ 0.7	8	5,439	ne.	45	n.	12	14	15	2	4.1	
Louisville	525	114	136	29.41	29.96	− .01	79.2	+ 2.9	98	3	89	63	8	69	29	69	65	68	2.72	− 0.8	9	1,950	n.	50	n.	12	15	8	8	4.7	
Evansville	434	72	82	......	......	......	80.2	......	95	2	89	66	16	71	26	....	....	....	3.22	......	11	3,822	ne.	34	sw.	26	16	11	4	3.4	
Indianapolis	823	154	164	29.12	29.96	− .05	76.4	+ 2.8	96	2	86	59	16	66	28	68	64	68	5.82	+ 2.5	6	5,474	ne.	38	e.	12	13	12	6	4.6	
Cincinnati	628	152	157	29.32	29.97	− .03	77.6	+ 2.6	98	2	87	62	15	68	26	68	63	65	3.65	− 0.1	6	4,347	ne.	35	n.	12	14	11	6	4.3	
Columbus	824	87	100	29.11	29.97	− .02	75.8	+ 3.5	95	20	88	56	8	64	35	66	62	69	1.49	− 1.8	6	4,573	ne.	25	nw.	4	17	9	5	3.5	
Pittsburg	842	116	123	29.10	29.98	− .03	74.2	+ 1.4	96	20	85	55	7	63	32	65	60	67	2.57	− 0.6	7	2,667	nw.	35	sw.	21	17	13	1	3.3	
Parkersburg	638	77	84	29.33	29.99	− .04	76.0	+ 3.9	96	20	87	58	1	65	30	67	63	70	1.46	− 2.5	7	3,064	ne.	28	w.	26	12	12	7	4.8	
Elkins	1,940	41	51	......	......	......	69.6	......	91	25	82	47	17	57	38	....	....	....	1.43	......	8	2,238	n.	20	n.	27	7	14	10	5.6	
Lower Lake Region.							71.7	+ 2.2										67	0.85	− 2.1										3.5	
Buffalo	768	178	206	29.18	29.98	.00	71.8	+ 3.3	86	11	80	52	15	64	29	66	63	76	0.52	− 2.6	5	7,138	w.	40	sw.	21	14	13	4	4.4	
Oswego	335	76	87	29.63	29.99	− .01	69.6	+ 1.4	94	21	78	51	16	62	28	63	58	70	0.82	− 1.8	6	5,553	se.	25	nw.	21	19	7	5	3.3	
Rochester	523	81	90	29.44	29.99	.00	71.3	+ 2.9	93	12	82	49	15	61	32	61	56	63	0.56	− 2.5	4	4,054	sw.	26	sw.	21	21	9	1	2.7	
Erie	714	92	102	29.26	30.00	+ .01	70.8	+ 1.3	90	20	78	54	15	64	26	64	60	68	0.07	− 3.2	3	6,035	s.	25	ne.	14	16	15	0	4.2	
Cleveland	762	190	201	29.18	29.97	− .03	71.6	+ 2.0	88	20	79	54	9	64	26	64	59	66	0.58	− 2.5	3	8,671	n.	34	n.	14	17	13	1	2.8	
Sandusky	629	62	74	29.32	29.98	− .02	73.4	+ 2.4	95	20	81	58	9	66	27	65	60	66	2.74	− 0.4	4	5,251	ne.	30	nw.	21	15	9	7	4.1	
Toledo	628	123	127	29.33	29.99	.00	73.0	+ 2.2	94	19	82	54	7	64	28	64	59	64	0.86	− 1.8	5	6,149	ne.	31	s.	12	18	10	3	3.4	
Detroit	730	160	166	29.21	29.97	− .03	72.2	+ 2.5	92	19	81	53	14	63	26	63	58	65	0.62	− 2.1	5	5,676	ne.	26	w.	21	18	10	3	3.2	
Upper Lake Region.							68.2	+ 2.5										77	2.10	− 0.9										4.6	
Alpena	609	61	65	29.35	29.99	.00	65.2	+ 1.7	93	18	74	42	15	57	33	63	61	85	0.83	− 2.6	9	5,760	se.	32	sw.	20	14	13	4	4.1	
Escanaba	612	43	57	29.33	29.97	.00	65.7	+ 1.1	83	18	74	41	14	58	24	62	59	79	2.42	− 1.4	8	5,624	se.	24	nw.	19	11	11	9	5.4	
Grand Haven	628	55	64	29.31	29.97	− .01	70.0	+ 3.0	91	28	80	50	15	60	28	63	58	70	0.38	− 2.3	4	4,931	nw.	30	sw.	11	16	13	2	3.4	
Marquette	734	67	95	29.17	29.94	− .05	65.5	+ 1.9	89	28	73	45	14	58	35	61	58	80	4.29	+ 1.4	13	6,245	se.	37	se.	20	5	16	10	6.0	
Port Huron	639	70	108	29.33	30.00	+ .02	70.4	+ 3.4	94	20	80	48	8	61	33	62	58	69	0.31	− 2.2	2	6,756	n.	26	s.	11	18	7	6	3.7	
Sault Ste. Marie	614	40	60	29.33	29.98	− .01	64.0	+ 3.2	87	19	74	44	14	54	31	59	57	83	2.81	0.0	10	5,037	e.	29	nw.	12	15	12	4	4.5	
Chicago	824	241	274	29.11	29.97	− .01	73.5	+ 2.6	91	10	79	63	15	68	21	69	68	84	0.91	− 2.0	5	10,280	ne.	54	nw.	11	17	12	2	3.4	
Milwaukee	681	124	142	29.27	29.98	− .01	71.8	+ 3.5	[illegible]	20	78	60	7	65	24	64	60	70	2.54	− 0.2	6	7,124	ne.	42	nw.	10	12	10	9	4.3	
Green Bay	617	49	57	29.32	29.97	− .04	70.8	+ 4.1	[illegible]	28	81	46	14	61	33	63	59	74	0.36	− 2.5	6	4,629	se.	26	sw.	20	14	13	4	4.8	
Duluth	702	95	106	29.19	29.93	− .03	64.8	+ 0.1	82	11	71	51	14	59	24	60	57	80	6.18	+ 2.8	13	6,557	ne.	35	ne.	22	6	10	15	6.1	
North Dakota.							66.2	− 0.2										68	1.49	− 0.4										3.8	
Moorhead	935	54	60	28.89	29.88	− .06	67.4	+ 2.2	88	22	79	42	13	56	37	60	56	72	2.94	+ 0.3	8	7,552	se.	47	se.	22	11	16	4	4.7	
Bismarck	1,674	16	29	28.13	29.86	− .06	67.0	− 0.5	92	15	80	43	31	54	40	58	53	67	0.97	− 1.0	6	7,212	e.	34	e.	19	18	9	4	3.8	
Williston	1,872	15	31	27.90	29.83	− .07	64.8	− 2.2	94	25	77	42	25	51	52	56	49	64	0.56	− 0.6	6	7,523	n.	48	e.	21	25	6	0	2.9	

TABLE I.—*Climatological data for Weather Bureau Stations, August, 1899*—Continued.

Stations.	Elevation of instruments: Barometer above sea level, feet.	Elevation of instruments: Thermometers above ground.	Elevation of instruments: Anemometer above ground.	Pressure, in inches: Mean actual, 8 a. m. and 8 p. m. ÷ 2.	Pressure, in inches: Mean reduced.	Pressure, in inches: Departure from normal.	Temperature of the air, in degrees Fahrenheit: Mean max. and min. ÷ 2.	Temperature: Departure from normal.	Temperature: Maximum.	Temperature: Date.	Temperature: Mean maximum.	Temperature: Minimum.	Temperature: Date.	Temperature: Mean minimum.	Temperature: Greatest daily range.	Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches: Total.	Precipitation: Departure from normal.	Precipitation: Days with .01, or more.	Wind: Total movement, miles.	Wind: Prevailing direction.	Wind: Maximum velocity: Miles per hour.	Wind: Maximum velocity: Direction.	Wind: Maximum velocity: Date.	Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
Upper Miss. Valley.							75.9	+ 3.1										71	3.51	+ 0.5										4.4	
Minneapolis	......	90	208	......	......	......	72.2	+ 3.1	96	10	82	54	13	63	31	....	....	....	3.16	0.0	12	7,181	s.	37	se.	20	7	13	11	....	
St. Paul	837	114	124	29.03	29.90	— .07	72.0	+ 2.9	96	10	81	56	13	63	32	64	59	70	2.80	— 0.5	13	5,120	se.	32	sw.	19	10	11	10	5.3	
La Crosse	720	70	78	......	......	......	72.7	+ 2.6	94	10	83	53	25	62	30	....	....	....	3.72	+ 0.4	11	4,227	se.	37	sw.	20	11	10	10	5.5	
Davenport	606	71	79	29.30	29.93	— .06	75.6	+ 2.8	95	3	86	55	14	65	31	68	64	72	4.47	+ 0.9	7	4,477	e.	24	w.	20	15	9	7	4.5	
Des Moines	867	84	88	29.03	29.93	— .04	75.0	+ 3.0	95	23	85	56	25	65	32	67	64	73	3.53	+ 0.3	9	5,170	se.	30	n.	20	9	15	7	4.7	
Dubuque	698	101	109	29.21	29.94	— .05	74.4	+ 2.8	93	10	85	53	15	64	31	65	61	68	1.95	— 1.2	8	4,374	se.	36	nw.	20	14	15	2	3.5	
Keokuk	614	64	78	29.30	29.93	— .05	77.0	+ 2.5	96	4	87	58	*	67	28	69	66	73	4.01	+ 1.2	7	4,066	sw.	24	w.	4	17	9	5	3.2	
Cairo	359	87	93	29.56	29.93	— .04	81.0	+ 4.0	96	12	90	68	24	73	24	73	71	77	1.06	— 1.8	4	3,955	s.	36	n.	13	9	15	7	4.7	
Springfield, Ill.	644	82	92	29.28	29.94	— .06	76.7	+ 3.3	97	3	88	56	16	66	29	68	65	71	3.81	+ 1.5	8	4,908	ne.	26	nw.	4	10	14	7	4.8	
Hannibal	534	75	107	......	......	......	77.4	+ 3.2	97	3	87	61	15	68	28	....	....	....	7.33	+ 5.4	7	4,525	e.	39	sw.	10	20	6	5	3.3	
St. Louis	567	111	210	29.34	29.93	— .04	81.1	+ 4.3	98	3	90	64	16	72	24	71	67	66	2.77	— 0.7	7	5,320	ne.	39	nw.	13	16	7	8	4.0	
Missouri Valley.							76.6	+ 3.5										68	3.45	— 0.7										4.2	
Columbia	783	4	84	......	......	......	78.8	+ 3.7	100	3	91	59	29	67	35	....	....	....	3.21	+ 0.4	10	4,430	se.	40	nw.	4	14	9	8	4.4	
Kansas City	963	78	95	28.92	29.90	— .07	79.4	+ 3.7	100	23	89	64	26	70	31	70	66	67	5.20	+ 1.3	11	5,464	se.	44	nw.	12	17	9	5	3.3	
Springfield, Mo.	1,324	100	103	28.57	29.91	— .06	80.8	+ 6.8	98	12	91	64	16	70	29	71	67	71	0.75	— 3.3	5	6,246	se.	32	n.	26	20	11	0	2.9	
Topeka	......	81	....	......	......	......	79.5	+ 4.7	100	23	90	61	25	69	31	....	....	....	2.05	— 2.4	7	......	se.	....	......	....	16	12	3	3.4	
Lincoln	1,199	74	84	28.63	29.87	— .09	76.8	+ 3.2	98	2	88	55	25	66	30	68	64	72	2.66	— 0.4	10	7,450	se.	48	ne	12	14	12	5	4.5	
Omaha	1,105	115	123	28.73	29.86	— .10	76.8	+ 3.1	95	10	86	60	25	68	25	68	65	74	6.18	+ 2.8	10	5,387	se.	42	ne.	1	13	10	8	5.0	
Sioux City	1,139	96	164	......	......	......	74.2	+ 2.6	98	10	85	54	24	64	31	....	....	....	4.91	+ 1.1	10	8,912	se.	59	nw.	2	12	11	8	4.7	
Pierre	1,572	50	62	28.20	29.81	— .13	74.2	+ 1.4	99	25	87	52	13	62	38	61	52	55	2.02	+ 0.4	9	9,015	se.	48	nw.	22	13	11	7	4.2	
Huron	1,306	56	67	28.49	29.85	— .10	72.4	+ 4.0	96	10	85	48	24	59	37	63	57	67	2.06	— 0.5	14	9,298	se.	48	se.	25	11	13	7	4.9	
Yankton	1,234	52	58	......	......	......	73.4	+ 1.6	98	28	84	52	24	63	32	....	....	....	5.46	+ 2.4	12	6,492	s.	32	s.	28	11	13	7	5.1	
Northern Slope.							66.5	— 1.3										56	1.34	0.0										4.2	
Havre	2,494	46	47	27.24	29.81	— .10	62.0	— 3.6	85	6	74	41	28	50	38	53	47	66	3.14	+ 1.8	13	7,426	sw.	49	sw.	22	19	11	1	3.4	
Miles City	2,371	42	50	27.35	29.77	— .13	70.0	— 1.7	96	*	85	45	24	55	45	59	52	61	1.39	+ 0.3	6	4,059	ne.	40	sw.	9	25	6	0	2.4	
Helena	4,108	88	93	25.79	29.91	+ .01	60.7	— 5.8	86	31	72	41	22	49	40	48	36	48	1.26	+ 0.6	11	5,295	sw.	43	sw.	20	12	5	14	5.1	
Kalispell	2,964	45	51	26.85	29.90	......	56.1	......	81	6	67	38	24	45	33	49	43	68	2.08	......	12	4,228	nw.	26	w.	25	5	15	11	6.0	
Rapid City	3,251	46	50	26.52	29.77	— .13	71.4	+ 1.5	98	27	84	47	24	58	44	57	46	48	0.52	— 0.8	6	3,948	se.	24	nw.	16	23	6	2	2.8	
Cheyenne	6,084	58	60	24.04	29.83	— .06	65.4	+ 0.4	88	28	80	39	24	51	41	50	35	44	1.15	— 0.4	10	7,388	s.	38	s.	8	14	10	7	4.5	
Lander	5,372	28	36	24.62	29.87	— .06	63.3	— 1.7	86	27	80	33	23	46	45	48	33	41	0.08	— 0.7	3	4,333	sw.	36	sw.	8	6	22	3	4.9	
North Platte	2,826	43	52	27.00	29.84	— .09	73.0	+ 1.6	97	28	85	44	24	61	38	63	58	68	1.83	— 0.6	8	6,761	se.	30	s.	22	16	11	4	4.3	
Middle Slope.							76.7	+ 4.0										56	1.84	— 0.8										2.8	
Denver	5,290	79	151	24.73	29.84	— .03	71.9	+ 1.8	94	28	87	51	20	57	39	55	41	44	1.78	+ 0.3	7	5,715	se.	43	sw.	15	19	9	3	3.0	
Pueblo	4,682	74	81	25.26	29.82	— .08	73.7	+ 1.4	95	21	89	41	13	59	43	56	42	42	2.63	+ 0.6	8	4,858	nw.	40	nw.	13	20	11	0	2.5	
Concordia	1,398	42	47	28.42	29.85	— .11	79.8	+ 5.4	102	22	92	59	21	68	35	69	64	67	2.78	— 0.1	8	5,079	se.	26	se.	27	17	12	2	3.8	
Dodge	2,504	44	52	27.30	29.81	— .10	80.8	+ 5.6	102	19	94	58	20	67	36	67	61	60	0.50	— 2.4	6	8,285	se.	39	sw.	17	21	10	0	3.1	
Wichita	1,351	78	85	28.48	29.85	— .07	82.0	+ 5.5	104	9	94	64	13	70	35	69	61	64	2.45	— 1.1	6	6,283	se.	40	sw.	11	16	12	3	3.5	
Oklahoma	1,218	54	62	28.61	29.85	— .07	83.8	+ 4.4	102	21	95	68	25	73	30	70	64	56	0.89	— 2.3	3	6,207	s.	24	sw.	8	27	4	0	1.2	
Southern Slope.							83.0	+ 6.4										45	0.30	— 2.6										1.2	
Abilene	1,749	45	54	28.10	29.84	— .10	87.1	+ 6.9	104	18	99	72	30	75	29	68	57	44	0.10	— 2.6	1	6,601	se.	26	se.	31	29	2	0	1.0	
Amarillo	3,691	54	61	26.21	29.83	— .10	78.8	+ 5.9	97	19	92	62	13	66	33	62	52	46	0.51	— 2.5	3	9,802	s.	54	n.	13	23	7	1	1.5	
Southern Plateau.							79.5	— 0.9										36	0.46	— 0.7										2.2	
El Paso	3,767	10	110	26.12	29.80	— .05	82.0	+ 3.0	99	27	94	65	9	70	32	63	51	43	0.91	— 0.9	7	6,833	nw.	38	nw.	7	16	14	1	3.6	
Santa Fe	6,998	47	50	23.34	29.87	— .07	68.7	+ 2.4	87	27	80	53	19	58	28	53	38	40	0.36	— 2.2	8	4,198	sw.	32	s.	1	21	9	1	2.9	
Flagstaff	6,885	12	25	23.40	29.98	......	60.9	......	81	31	76	34	23	46	46	51	....	....	2.72	......	7	......	sw.	....	......	....	11	10	10	....	
Phenix	1,076	47	57	28.65	29.74	— .03	87.5	— 0.7	108	30	101	67	24	74	36	66	53	38	0.89	— 0.1	5	3,350	e.	24	se.	21	25	5	1	2.0	
Yuma	139	16	50	29.57	29.71	— .04	86.6	— 4.1	109	30	102	63	18	71	40	67	55	42	0.06	— 0.3	1	3,814	w.	26	s.	1	27	4	0	1.1	
Independence	3,907	10	58	25.88	29.72	— .05	72.6	— 5.0	91	1	86	52	17	59	32	51	25	19	0.06	— 0.2	1	5,811	nw.	32	w.	11	27	4	0	1.3	
Middle Plateau.							65.1	— 5.6										37	0.59	+ 0.3										3.4	
Carson City	4,720	82	92	25.22	29.89	+ .05	62.1	— 4.9	86	30	76	39	23	48	41	49	35	44	0.47	+ 0.3	4	5,246	w.	34	w.	6	19	8	4	3.2	
Winnemucca	4,340	59	70	25.60	29.87	+ .03	63.4	— 7.2	87	30	79	30	22	48	48	48	28	33	0.23	+ 0.2	4	6,864	sw.	37	w.	20	14	6	11	4.3	
Cedar City	5,850	36	47	24.26	29.88	......	68 1	......	85	31	78	44	22	58	33	51	33	32	1.00	......	4	5,814	se.	24	s.	21	20	6	5	2.7	
Salt Lake City	4,344	83	90	25.56	29.84	— .02	69.8	— 4.8	91	11	82	46	23	58	37	53	35	33	1.06	+ 0.3	3	4,913	se.	32	w.	16	16	12	3	3.5	
Grand Junction	4,608	43	50	25.35	29.85	......	72.9	......	93	21	86	50	23	60	36	56	40	41	2.42	....	13	4,399	se.	31	se.	15	18	8	5	3.5	
Northern Plateau.							63.6	— 6.2										52	1.05	+ 0.8										4.6	
Baker City	3,470	49	55	26.37	29.90	— .04	59.4	— 6.7	86	5	73	37	15	46	39	48	37	54	1.02	+ 0.8	8	3,795	nw.	27	w.	31	12	11	8	4.5	
Boise	2,736	61	68	27.06	29.84	— .04	66.4	— 5.8	92	5	81	39	15	52	41	55	46	53	0.44	+ 0.2	6	3,073	se.	22	e.	20	16	8	7	3.9	
Pocatello	4,482	48	56	25.44	29.87	......	64.2	— 3.4	90	31	79	33	22	50	39	50	36	42	0.29	— 0.1	5	7,444	se.	38	s.	5	17	6	8	4.0	
Spokane	1,943	99	107	27.88	29.90	— .01	61.8	— 7.2	89	5	73	43	22	50	35	52	43	58	1.34	+ 1.0	12	4,334	s.	26	sw.	25	9	8	14	6.3	
Walla Walla	1,018	65	73	28.84	29.90	— .02	66.2	— 8.0	93	4	77	47	29	55	38	55	46	52	2.16	+ 2.0	9	4,500	s.	25	ne.	13	16	10	5	4.1	
N. Pac. Coast Reg.							58.8	— 2.9										79	2.61	+ 1.7										6.7	
Fort Canby	179	10	34	29.83	30.02	— .02	58.1	— 1.0	72	30	62	51	*	54	20	55	53	88	2.97	+ 1.9	18	6,379	n.	50	se.	9	6	5	20	7.5	
Neah	50	7	24	29.94	29.99	— .04	55.6	— 3.3	67	3	60	46	*	51	15	54	52	90	1.79	— 0.5	12	4,244	w.	22	w.	2	3	10	18	7.5	
Port Crescent	256	15	20	......	......	......	54.5	— 2.2	69	*	62	39	21	48	28	....	....	....	1.40	+ 0.6	10	3,419	w.	20	sw.	12	5	12	14	6.4	
Seattle	119	114	121	29.86	29.98	— .05	60.6	— 2.6	79	5	68	46	28	54	26	55	52	77	2.50	+ 1.9	11	3,640	se.	17	s.	31	5	11	15	7.0	
Tacoma	213	113	120	......	......	......	......	......	....	....	....	....	....	....	....	....	....	....	......	......	....	......	......	....	......	....	....	....	....	....	
Astoria	......	18	....	......	......	......	59.9	— 2.3	72	3	65	47	28	54	17	....	....	....	4.85	+ 3.8	15	......	w.	....	......	....	10	3	18	....	
Portland, Oreg	153	208	213	29.82	29.98	— .04	61.5	— 4.4	84	30	69	46	28	54	30	56	51	73	2.50	+ 2.0	11	5,333	nw.	32	s.	9	7	9	15	6.4	
Roseburg	521	56	67	29.40	29.96	— .05	61.6	— 4.6	85	4	72	43	28	52	39	55	50	69	2.23	+ 2.0	8	2,950	nw.	21	sw.	26	10	10	11	5.5	
Mid. Pac. C'st Reg.							62.2	— 2.6										63	0.27	+ 0.2										3.8	
Eureka	64	60	69	29.96	30.02	+ .01	55.9	— 0.6	67	9	60	48	25	52	18	53	51	86	0.42	+ 0.3	5	4,035	nw.	36	nw.	22	7	13	11	5.8	
Mount Tamalpais	2,375	11	18	27.49	29.93	......	61.4	......	79	23	68	45	12	54	22	51	39	50	0.01	......	1	12,283	w.	91	nw.	20	24	4	3	2.3	
Red Bluff	334	54	58	29.50	29.84	.00	73.8	— 7.3	100	30	87	55	18	60	41	58	43	38	0.02	0.0	1	4,505	se.	24	n.	21	24	7	0	1.6	
Sacramento	71	106	117	29.79	29.86	+ .01	68.0	— 4.7	93	23	82	50	21	54	39	57	49	58	0.02	0.0	1	7,757	sw.	28	sw.	20	24	4	3	2.6	
San Francisco	153	161	167	29.78	29.94	+ .02	58.3	— 0.4	78	22	64	50	30	53	21	54	52	84	T.	0.0	0	10,722	sw.	39	w.	20	18	11	2	3.3	
Point Reyes Light	......	12	16	......	......	......	55.0	+ 0.1	73	23	60	48	30	50	23	....	....	....	0.91	+ 0.8	1	13,928	nw.	54	nw.	25	6	4	21	7.5	
S. Pac. Coast Reg.							68.4	— 3.1										67	0.02	0.0										2.4	
Fresno	332	67	70	29.49	29.83	+ .01	75.1	— 6.6	100	1	91	53	22	59	40	58	44	40	0.00	0.0	0	5,150	nw.	23	nw.	18	27	3	1	1.2	
Los Angeles	330	74	82	29.53	29.88	.00	68.6	— 1.8	89	29	79	53	21	58	32	60	57	77	0.01	0.0	1	3,109	w.	13	w.	5	20	10	1	3.1	
San Diego	87	94	102	29.78	29.88	— .01	65.8	— 3.1	76	29	70	58	13	62	16	61	58	78	0.07	0.0	1	4,537	nw.	19	nw.	30	28	1	2	1.7	
San Luis Obispo	201	10	46	29.73	29.95	+ .05	64.0	— 0.8	88	28	75	47	23	53	39	55	51	72	0.00	0.0	0	3,633	w.	21	w.	14	15	12	4	3.8	
West Indies.																															
Basseterre	29	41	54	29.93	29.96	......	81.4	......	88	6	86	70	7	77	14	76	74	78	3.26	......	17	8,942	e.	72	ne.	7	7	20	4	5.4	
Bridgetown	30	57	65	29.90	29.92	......	81.5	......	89	28	87	73	13	76	13	76	74	78	3.21	......	21	6,572	e.	28	s.	7	1	19	11	6.5	
Cienfuegos	52	62	67	29.89	29.94	......	82.0	......	94	5	91	71	10	73	23	76	74	79	4.44	......	13	4,818	ne.	26	sw.	13	21	9	1	3.0	
Havana	57	83	100	29.90	29.96	......	82.0	......	92	29	88	73	11	76	18	77	75	81	0.14	......	5	6,521	e.	33	ne.	4	21	8	2	3.6	
Kingston	358	55	62	29.62	29.92	......	81.1	......	94	24	90	70	7	72	21	74	71	75	1.09	......	6	5,266	ne.	29	se.	14	4	23	4	5.7	
Port of Spain	286	38	52	29.85	29.89	......	80.3	......	90	24	87	71	4	75	19	75	73	80	9.15	......	20	3,357	e.	16	e.	30	7	17	7	5.7	
Puerto Principe	40	65	66	29.58	29.92	......	82.1	......	98	24	93	66	25	71	29	74	72	81	3.70	......	9	5,481	ne.	31	ne.	25	8	20	3	4.5	
Roseau	25	37	47	......	......	......	......	......	....	....	....	....	....	....	....	....	....	....	......	......	....	......	......	....	......	....	....	....	....	....	
San Juan	82	48	56	29.87	29.95	......	80.4	......	88	29	86	71	20	75	16	76	74	81	10.38	+ 4.5	19	5,743	e.	66	e.	8	14	12	5	4.4	
Santiago de Cuba	82	45	51	29.83	29.91	......	82.4	......	96	31	91	68	11	74	22	74	72	74	5.16	......	6	3,677	ne.	24	e.	26	8	20	3	4.5	
Santo Domingo	59	82	88	......	......	......	......	......	....	....	....	....	....	....	....	....	....	....	......	......	....	......	......	....	......	....	....	....	....	....	
Willemstad	75	39	46	29.80	29.87	......	82.6	......	91	9	87	74	24	78	12	76	74	79	1.59	......	11	8,933	e.	26	e.	24	7	17	7	5.5	

NOTE.—The data at stations having no departures are not used in computing the district averages. Letters of the alphabet denote number of days missing from the record. * Two or more dates. † Received too late to be considered in departures, etc. ‡ Anemometer cups blown away during hurricane of 17th; maximum velocity, estimated, 105 miles per hour.

TABLE II.—*Climatological record of voluntary and other cooperating observers, August, 1899.*

Stations.	Temperature. (Fahrenheit.) Maximum.	Temperature. (Fahrenheit.) Minimum.	Temperature. (Fahrenheit.) Mean.	Precipitation. Rain and melted snow.	Precipitation. Total depth of snow.
	°	°	°	Ins.	Ins.
Alabama.					
Alco	96	66	79.7	7.88	
Ashville	100	62	80.4	3.43	
Bermuda	95	68	81.0	3.88	
Birmingham	98	67	82.0	2.15	
Bridgeport				3.07	
Citronelle	95	69	81.7	7.02	
Clanton	95	64	79.7	2.82	
Daphne	100	68	82.6	5.10	
Decatur	101	65	81.8	3.62	
Demopolis				2.08	
Elba d	100	61	79.8	3.99	
Eufaula a	100	67	81.8	5.79	
Evergreen	93	68	79.9	1.50	
Florence a				0.71	
Florence b	100	67	82.7	0.70	
Fort Deposit	98	67	81.2	2.63	
Gadsden	101	63	80.6	3.69	
Goodwater	102	61	81.2	3.25	
Greensboro	97	68	81.6	1.89	
Hamilton				3.69	
Healing Springs	98	65	81.2	3.49	
Highland Home	94	67	80.0	3.70	
Jasper	99	65	81.4	2.48	
Livingston a	96	67	81.8	3.95	
Lock No. 4	96	65	80.0	3.82	
Madison Station	99	65	81.6	2.67	
Maplegrove	99	61	80.8	2.23	
Marion	98	66	82.6	3.50	
Mount Willing	100	62	84.2	4.47	
Newbern	97	68	83.0	1.60	
Newburg	97	64	81.0	3.08	
Newton	97	64	79.3	8.55	
Oneonta	93	65	78.4	1.14	
Opelika	96	58	80.4	3.69	
Oxanna	96	65	79.7	3.66	
Pineapple	102	65	82.8	4.05	
Pushmataha	97	65	81.8	2.77	
Riverton	103			2.61	
Rockmills	100	65	80.8	1.68	
Scottsboro	95	62	79.7	3.92	
Selma	101	65	83.5	3.45	
Talladega	98	64	80.6	2.99	
Tallassee				3.39	
Thomasville	98	66	81.6	1.04	
Tuscaloosa	99	66	82.0	3.59	
Tuscumbia	99	68	83.2	1.32	
Union Springs	97	66	81.7	6.93	
Uniontown	99	69	83.6	3.50	
Valleyhead	98	64	79.4	4.51	
Warrior				1.28	
Wetumpka	99	68	82.6	2.41	
Wilson *1	98	72	81.8	7.57	
Alaska.					
Killisnoo	68	40	53.9	1.95	
Sitka	67	40	54.6	8.35	
Tyoonk	71	38	56.4	2.72	
Arizona.					
Allaire Ranch				0.57	
Arizona Canal Co. Dam	108	58	84.0	1.79	
Aztec *5	112	79	97.2	0.00	
Benson *1	98	74	83.8	1.54	
Bisbee	93	58	74.7	4.77	
Blaisdell *1	111	74	92.8	0.00	
Bowie				0.00	
Buckeye	108	56	84.7	0.55	
Camp Creek	100	61	80.4	0.69	
Casa Grande *1	106	75	89.5	T.	
Champie Camp	111	63	85.6	1.85	
Cochise *1	100	63	78.6	0.83	
Congress	101	66	82.6	0.75	
Dragoon				3.10	
Dragoon Summit *1	95	60	75.6	2.34	
Dudleyville	103	53	81.7	1.45	
Fort Apache		50		0.96	
Fort Defiance	85f	41	66.0f	1.73	
Fort Grant		52		0.52	
Fort Huachuca	93	53	74.8	5.77	
Fort Mohave	118	61c	88.2	0.87	
Gilabend *1	110	68	87.9	0.42	
Holbrook	99	47	75.4	0.98	
Hot Springs	106	62	86.2	0.28	
Ingleside	111	62	87.6	0.75	
Jerome	95	57	76.9	0.60	
Lochiel *1	90	65	75.4	1.91	
Maricopa *1	112	79	94.0	0.28	
Mesa	108	55	84.3	0.30	
Mount Huachuca	93	50	74.0	4.90	
Music Mountain	107	52	82.6	0.49	
Natural Bridge				1.05	
Oracle	93	58	75.8	2.92	
Oro				0.80	
Oro Blanco	98d	54d	80.0d	1.49	
Pantano *1	96	65	79.2	2.67	
Peoria	108	65	88.2	0.30	
Phenix	111	59	87.0	1.53	
Pima		58		1.34	
Arizona—Cont'd.					
Pinal Ranch				1.76	
Prescott	95	40	67.6	0.89	
San Carlos	108	56	83.5	0.35	
San Simon *1	99	70	82.0	0.00	
Sentinel *5	109	78	93.6	0.00	
Signal	113	52	84.4	0.41	
Snowflake	93	42	68.7	1.43	
Strawberry	89	39	65.6	3.24	
Texas Hill *1	114	80	96.8	T.	
Tombstone	97	61	76.9	1.56	
Tonto				2.20	
Tuba	100	53	76.0	0.87	
Tucson	104	62	83.6	1.82	
Vail *5	99	70	82.9	0.22	
Walnut Grove				0.08	
White Hills	102	60	80.9	2.25	
Willcox				0.51	
Winslow	99	46	74.3	1.07	
Yarnell				1.06	
Arkansas.					
Amity	102	63	82.8	1.00	
Arkansas City				3.05	
Beebranch	105f	63f	80.2f	1.20	
Blanchard Springs	102	65	82.8	2.33	
Brinkley	100	63	82.7	1.34	
Camden a				1.86	
Camden b	102	60	83.6	1.26	
Canton	99	60	80.0	2.63	
Conway	112	67	85.8	2.92	
Corning	103	61	81.5	3.65	
Dallas	104	64	84.3	2.42	
Dardanelle				1.01	
Elon	104	65	82.8	3.25	
Fayetteville	101	59	80.4	1.97	
Forrest	99	63	82.3	2.43	
Fulton				0.47	
Hardy	96	65	80.4	3.08	
Helena a				1.81	
Helena b	103	69	84.4	1.76	
Hot Springs a	106	64	85.2	1.55	
Hot Springs b				1.68	
Jonesboro		65		1.34	
Keesees Ferry	106	63	81.6	0.73	
Lacrosse		65		6.45	
Lonoke	100	63	82.0	2.04	
Luna Landing *5	97	68	79.4	2.12	
Malvern	107	63	83.6	3.83	
Marianna	97	65	81.2	3.58	
Marvell	100	66	82.0	2.62	
Moore				2.22	
Mossville	98	64	80.2	0.38	
Mount Nebo	95	65	80.2	0.12	
Nashville	108	64	84.5	1.98	
New Gascony	99	64	82.6	2.09	
Newport a				4.32	
Newport b	102	65	82.9	4.39	
Newport c	101	63	81.6	5.54	
Oregon	99	61	80.2	0.92	
Osceola	104	64	84.0	2.33	
Ozark	105	68d	87.7	0.15	
Pinebluff	104	64	84.1	1.35	
Pocahontas	96	63	80.4	3.28	
Pond	98	57	79.0	0.80	
Powell		61		0.95	
Prescott	106	66	85.8	0.45	
Rison		54		0.29	
Russellville	105	64	81.4	1.90	
Silver Springs	99	60	80.5	0.65	
Spielerville	110	64	84.4	0.07	
Stamps	106	65	85.0	0.11	
Stuttgart	101	62	82.1	2.78	
Texarkana	105	65	85.6	0.73	
Warren	104	65	84.4	2.43	
Washington	101	67	84.5	0.72	
Wiggs *1	104	66	84.4	3.71	
Winslow	94	62	79.2	0.67	
Witts Springs	101	61	80.8	1.68	
California.					
Agnew	88	46	66.0	0.00	
Anada	95	38	62.4	0.41	
Angiola	102	46	73.8	T.	
Arlington Heights	103c	49	72.4	0.00	
Bakersfield	101	47	74.4	T.	
Ballast Point L. H				0.15	
Bear Valley				0.93	
Berkeley	78	51	61.2	T.	
Bishop	93	38	66.7	0.05	
Blue Lakes City	98	41	69.2	T.	
Boca *1	86	30	50.8	0.98	
Bodie	77	30	50.2	0.88	
Bowmans Dam				1.15	
Cahto				0.00	
Caliente *1	96	60	75.6	0.00	
Campbell	88	41	61.5	0.00	
Cape Mendocino L. H				0.00	
Cedarville	87	34	62.2	0.53	
California—Cont'd.					
Centerville *1	100	58	69.2	0.09	
Chico *1	103	59	73.2	0.12	
Cisco *1	74	40	52.3	0.50	
Claremont	96	36	67.0	0.00	
Corning *1	98	65	76.8	0.00	
Coronado	73	60	66.4		
Craftonville	102	50	73.0	0.00	
Crescent City	71	41	56.1	1.53	
Crescent City L. H				1.53	
Cuyamaca	95	29	62.0	T.	
Delano *1	95	61	78.6	T.	
Delta *1	99	52	70.3	0.00	
Dewey	101	41	75.2	T.	
Drytown	100	42	72.0	0.01	
Durham *1	94	54	73.0	0.01	
East Brother L. H				0.00	
Edmanton *1	86	40	58.7	1.64	
El Cajon	100	45	70.2	T.	
Elmwood	99	44	70.8	T.	
Elsinore	108	44	74.0	T.	
Escondido	92	41	67.2	T.	
Fallbrook *1	96	55	67.2	0.03	
Folsom City *1	96	60	71.5	0.06	
Fordyce Dam				1.75	
Fort Ross	80	44	58.1	0.00	
Georgetown	88	47	67.2	0.14	
Gilroy (near)	93	41	64.2	T.	
Goshen *5	98	56	77.8	0.00	
Grand Island *5	99	52	72.8	0.13	
Grass Valley				0.42	
Greenville	89	29	58.6	0.60	
Hanford	99	47	73.6	0.00	
Healdsburg	98	36	64.9	0.11	
Hollister	91	42	62.6	0.00	
Humboldt L. H				0.69	
Indio *1	108	70	87.2	0.00	
Iowa Hill *1	89	52	67.0	0.32	
Irvine	98	60	77.5	T.	
Jackson	84	44	64.6	0.07	
Jolon				0.00	
Keene *1	92	52	70.8	0.00	
Kennedy Gold Mine	89	44	66.8	0.00	
Kernville				0.00	
King City *1	94	48	59.0	0.00	
Kingsburg *5	95	65	80.1	0.00	
Kono Tayee	86	54	70.3	T.	
Lagrange *5	100	55	75.8	0.02	
Lamesa				T.	
Lankershim	100	52	74.8	0.05	
Laporte *1	78	43	54.7	0.82	
Las Fuentes Ranch				0.00	
Legrand	99	49	73.6	0.01	
Lemoncove	101c	52c	76.0c	0.00	
Lemoore a *1	97	54	76.3	0.00	
Lick Observatory	80	41	61.3	0.12	
Lime Point L. H				0.03	
Lodi	93	49	68.7	0.39	
Los Alamos				0.00	
Los Gatos b	88	46	63.2	T.	
Malakoff Mine	87	46	65.2	0.67	
Mammoth Tank *1	111	75	91.0	T.	
Manzana	99	53	75.2	0.00	
Mare Island L. H				0.00	
Merced a *1	98	59	74.6	0.20	
Merced b	99	49	73.7	0.14	
Mills College				0.00	
Milo				0.00	
Milton (near) *1	94	52	69.8	0.12	
Modesto *1	96	58	67.9	0.00	
Mohave *1	97	59	75.3	0.00	
Mokelumne Hill *3		50	65.4	T.	
Monterio	102	52	74.8	0.00	
Monterey *1	79	54	63.0	0.09	
Morena Dam	102	38	70.8	0.00	
Napa b	96	44	65.4	0.17	
Needles	108	69	89.4	0.00	
Nevada City	89	41	62.6	0.29	
Newhall *1	106	56	72.0	0.00	
North Ontario	100	50	70.2	T.	
North San Juan *1	90	48	66.4	0.66	
Oakland a	88	50	62.0	0.00	
Ogilby *1	118	80	95.8	0.00	
Oleta *1	88	51	65.5	0.17	
Orland *1	102	60	78.5	0.00	
Palermo	98	47	72.2	0.18	
Paso Robles b	88	44	65.6	0.00	
Peachland *5	85	46	62.8	0.19	
Piedras Blancas L. H				0.00	
Pilot Creek				0.23	
Pine Crest	91	51	67.0	0.00	
Placerville	85	43	63.6	0.10	
Point Ano Nuevo L. H				0.00	
Point Arena L. H				0.00	
Point Bonita L. H				0.11	
Point Conception L. H				0.00	
Point Firmin L. H				0.00	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
California—Cont'd.	°	°	°	*Ins.*	*Ins.*
Point George L. H	......	......	......	0.46	
Point Hueneme L. H	......	......	......	0.00	
Point Lobos	66	50	57.0	0.00	
Point Loma L. H	......	......	......	0.10	
Point Montara L. H	......	......	......	0.00	
Point Pinos L. H	......	......	......	0.19	
Point Sur L. H	......	......	......	0.06	
Pomona (near)	102	47	72.6	0.00	
Poway *3	98	56	65.0	0.00	
Quincy	86	33	59.5	1.09	
Ranch House	92	60	74.4	T.	
Raymond	105	44	74.4	0.08	
Redding	97	56	73.6	0.08	
Redlands	104	50	73.4	0.04	
Represa	90	52	69.4	0.04	
Rio Vista	92	49	68.8	T.	
Roe Island L. H	......	......	......	0.00	
Romie	94	40	64.3	0.00	
Rosewood	100	47	71.6	T.	
Sacramento *a*	90	48	68.0	0.04	
Salinas *1	76	50	60.4	0.00	
Salton *1	117	82	95.8	0.45	
San Bernardino	105	42	71.4	T.	
San Leandro *1	84	58	63.6	T.	
San Luis L. H	......	......	......	0.00	
San Mateo *1	90	57	67.4	0.02	
San Miguel *1	91	53	67.8	0.00	
Santa Barbara *a*	81	54	65.6	0.00	
Santa Barbara L. H	......	......	......	0.00	
Santa Clara *a*	......	......	......	0.00	
Santa Cruz *b*	86	40	62.0	0.05	
Santa Cruz L. H	......	......	......	0.04	
Santa Maria	80	48	64.4	0.00	
Santa Monica *1	78	59	66.5	0.00	
Santa Paula	90[f]	54[f]	69.7[f]	0.00	
Santa Rosa *1	87	44	64.1	0.15	
Shasta	102	51	74.7	0.06	
Sierra Madre	94	49	69.0	0.10	
Sonoma	......	......	......	0.05	
S. E. Farallone L. H	......	......	......	0.00	
Stockton *a*	92	50	67.2	0.05	
Summerdale	82	43	60.4	0.02	
Susanville	84	37	60.6	0.46	
Tehama *1	97	66	74.8	0.00	
Tejon Ranch	96	56	75.9	0.00	
Templeton *1	98	50	62.2	0.00	
Thermalito	101	52	72.6	0.18	
Trinidad L. H	......	......	......	0.73	
Truckee *1	82	46	63.5	0.92	
Tulare *b*	......	......	......	0.00	
Tulare *c*	106	48	75.6	0.00	
Ukiah	101	41	67.4	0.02	
Upperlake	96	43	68.6	0.03	
Upper Mattole *1	100	48	66.2	0.22	
Vacaville *a* *1	96	56	69.0	0.16	
Ventura	78	48	63.2	0.00	
Visalia *a* *1	88	58	69.2	0.00	
Visalia *b*	100	46	73.0	0.00	
Volcano Springs *1	120	80	94.3	0.07	
Walnut Creek	94	55	69.6	0.00	
West Saticoy	......	......	......	0.00	
Wheatland	92	48	69.4	0.14	
Williams *1	98	60	75.6	0.00	
Wilmington	85	60	69.1	0.00	
Wire Bridge *5	93	53	68.2	0.12	
Yerba Buena, L. H	......	......	......	0.00	
Yreka	90	40	64.6	0.12	
Yuba City *5	86	57	71.1	0.18	
Colorado.					
Antlers	89	42	67.6	0.99	
Arkins	......	......	......	0.94	
Aspen	......	......	......	0.68	
Boulder	92	49	70.4	1.81	
Boxelder	......	......	......	1.46	
Breckenridge	77	28	50.8	1.60	
Canyon	99	41	75.7	0.79	
Castlerock	92	38	66.6	2.39	
Cedaredge	92	40	66.8	1.36	
Cheyenne Wells	101	50	75.6	0.55	
Clearview *1	82	36	52.8	0.68	
Colorado Springs	92	46	68.8	0.79	
Cope	102	50	74.2	1.19	
Cripple Creek	......	41	......	1.47	
Crook	102	46	73.8	1.55	
Delta	100	36	70.6	1.78	
Dumont	......	......	......	2.00	
Durango	89	41	66.0	2.85	
Fairview	89	32	59.4	2.73	
Fort Collins	95	40	67.6	0.99	
Fort Morgan	98	48	74.0	0.84	
Fox	......	......	......	0.90	
Garnett	86	30	60.5	0.93	
Georgetown	79	40	59.8	......	
Gilman	......	......	......	2.40	
Gleneyrie	87	44	67.4	1.22	
Greeley	95	41	69.6	1.04	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Colorado—Cont'd.	°	°	°	*Ins.*	*Ins.*
Gunnison	82	28	57.2	2.06	
Hamps	93	45	68.2	2.19	
Hoehne	97	40	71.0	0.94	
Holly	......	......	......	2.95	
Holyoke	......	......	......	1.17	
Holyoke (near)	105	40	74.0	2.59	
Hugo	......	......	......	2.55	
Husted	97	40	69.4	1.75	
L ke Moraine	77	34	55.6	2.44	
Lamar	106	49	78.8	2.40	
Laporte	......	......	......	0.95	
Las Animas	102	48	76.1	1.53	
Leadville (near) *1	74	36	51.2	1.41	
Leroy	99	48	71.7	2.38	
Longs Peak	79	32	56.2	1.73	
Mancos	87	30	62.4	2.63	
Meeker	90	29	62.6	2.13	
Minneapolis	105	53	78.4	1.37	
Mitchell	......	......	......	2.20	
Moraine	80	34	59.2	1.32	
Pagoda	91	27	62.0	1.80	
Parachute	94	43	70.8	1.05	
Perry Park	......	......	......	1.10	
Rangely	91	33	63.1	2.04	
Rockyford	99	45	73.7	2.22	
Ruby	......	......	......	0.18	
Saguache	82	42	71.0	0.86	
Salida	90	33	64.7	0.79	
San Luis	88	32	61.9	0.54	
Santa Clara *1	85	48	64.4	1.11	
Seibert	......	......	......	0.68	
Smoky Hill Mine	88	36	60.0	3.98	
Springfield	......	......	......	2.73	
Strickler Tunnel	......	......	......	1.91	
Trinidad	......	......	......	0.44	
Troutvale	81	20	52.6	1.64	
T. S. Ranch	87[c]	47[c]	68.3[c]	2.07	
Twin Lake	......	......	......	1.15	
Vilas	......	......	......	1.96	
Wagon Wheel	......	21	......	0.69	
Walden	......	......	......	1.09	
Wallet	......	......	......	T.	
Westcliffe	86	37	62.0	0.55	
Wray	100	46	74.6	1.38	
Yuma	......	......	......	2.22	
Connecticut.					
Canton	89	43	67.4	3.00	
Colchester	88	45	68.1	4.21	
Falls Village	......	......	......	0.88	
Greenfield Hill	......	......	......	0.52	
Hartford *a*	86	50	69.4	1.31	
Hartford *b*	......	......	......	0.90	
Hawleyville	89	43	69.2	1.19	
Lake Konomoc	......	......	......	2.85	
Middletown	90	44	69.6	1.72	
New London	84	49	66.8	2.59	
North Grosvenor Dale	91[b]	40[b]	68.6[b]	1.26	
Norwalk	89	44	69.4	0.37	
Southington	86	45	68.4	0.45	
South Manchester	......	......	......	1.36	
Storrs	86	45	67.2	3.27	
Voluntown	88	43	68.2	2.22	
Wallingford	......	......	......	1.02	
Waterbury	92	43	70.8	1.03	
West Cornwall	85	47	67.2	1.11	
West Simsbury	......	......	......	3.79	
Winsted *1	87	48	66.5	......	
Delaware.					
Milford	96	60	75.0	2.94	
Millsboro	93	58	73.6	7.66	
Newark	94	52	73.5	2.64	
Seaford	96	61	75.6	6.40	
District of Columbia.					
Distributing Reservoir *5	......	......	76.4	4.38	
Receiving Reservoir *5	......	......	75.4	4.13	
West Washington	96	55	75.8	3.90	
Florida.					
Archer	99	......	......	7.85	
Bartow	97	69	82.7	7.58	
Brooksville	95	71	82.3	5.78	
Clermont	100	64	84.3	11.73	
Dalkeith	96	70	81.3	......	
De Funiak Springs	102	65	81.2	11.80	
Deland	97	68	80.9	......	
Dry Tortugas	96	77	86.1	1.36	
Earnestville	99	70	83.6	6.70	
Estero *1	96	75	82.2	......	
Eustis	97	71	83.2	6.02	
Federal Point	96	70	82.0	6.18	
Fort Meade	98	......	......	3.88	
Gainesville	99	70	83.6	7.69	
Homeland	93	67	79.8	......	
Huntington	97	68	81.8	8.59	
Inverness	93	70	81.8	7.22	
Jasper	97	68	82.2	6.13	
Kissimmee	100	......	......	11.06	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Florida—Cont'd.	°	°	°	*Ins.*	*Ins.*
Lake Butler	101	70	83.0	6.30	
Lake City	101	69	82.7	3.66	
Macclenny	101	68	83.2	5.18	
Manatee	93	68	81.2	3.29	
Merritts Island	96	71	83.0	7.55	
Myers	93	72	81.8	6.72	
New Smyrna	95	69	80.8	7.02	
Ocala	101	69	82.9	4.61	
Orlando	97	72	83.6	6.28	
Plant City	98	68	82.6	5.59	
Rockwell	......	......	......	8.23	
St. Andrews	99	70	82.4	7.52	
St. Francis	97	69	81.7	6.97	
Sebastian	94	71	81.8	4.56	
Stephensville *1	94	72	81.2	10.22	
Switzerland *1	91	69	80.7	4.37	
Tallahassee	92	69	80.0	11.46	
Tarpon Springs	92	70	82.2	2.02	
Wausau	98	67	81.6	......	
Georgia.					
Adairsville	94	64	79.0	4.64	
Alapaha	100	66	82.0	4.19	
Albany	100	69	84.2	4.09	
Allentown	101	67	83.8	3.26	
Americus	96	68	82.0	4.39	
Athens *b*	98	65	81.2	3.93	
Bainbridge	100	70	81.8	7.23	
Bellville	96	60	80.0	11.37	
Blakely	95	70	80.2	5.39	
Brag	98	......	......	6.02	
Camak	100	66	82.2	6.26	
Carlton	......	......	......	4.09	
Clayton	93	61	76.6	7.28	
Columbus	99	69	82.6	1.51	
Covington	105	65	83.2	2.96	
Crescent	......	......	......	12.00	
Dahlonega	93	58	75.2	4.37	
Diamond	98	......	......	4.24	
Dublin	......	......	......	6.67	
Eastman	101	67	83.4	1.17	
Elberton	99	65	81.2	3.17	
Fitzgerald	96	66	81.2	4.22	
Fleming	105	64	82.8	9.76	
Fort Gaines	96	64	81.4	7.67	
Franklin	94	62	81.0	2.80	
Gainesville	98	64	78.4	4.10	
Gillsville	100	63	80.6	3.48	
Greenbush	95	61	78.6	4.15	
Griffin	98	62	79.0	2.65	
Harrison	......	......	......	6.02	
Hawkinsville	97	64	80.0	8.45	
Hephzibah *6	94	70	82.0	4.20	
Jesup	101	62	82.4	4.62	
Louisville	99	67	82.4	5.19	
Lumpkin	98	68	82.0	4.98	
Marshallville	96	68	82.1	3.59	
Mauzy	99	68	81.6	6.19	
Millen	101	57	83.0	3.54	
Morgan	99	69	82.0	4.65	
Newnan	99	65	80.8	2.74	
Oakdale	......	......	......	5.48	
Pelham	99	......	......	7.08	
Point Peter	103	60	79.6	4.27	
Poulan	97	67	81.0	5.33	
Putnam	97	63	80.6	4.80	
Quitman	102	66	82.4	6.73	
Ramsey	97	61	77.8	4.41	
Rome	101	63	81.2	2.09	
Talbotton	100	66[c]	82.0[c]	3.46	
Tallapoosa	94	59	77.8	3.67	
Thomasville	99	69	83.0	4.28	
Toccoa	95	63	79.2	5.80	
Union Point	98	65	81.9	4.46	
Washington	98	66	81.8	6.68	
Way Cross	100	67	83.6	6.23	
Waynesboro	96	63	78.4	4.46	
Westpoint	99	66	81.6	2.81	
Idaho.					
American Falls	96	33	65.8	0.20	
Atlanta	84	29	54.1	1.78	
Blackfoot	90	30	63.0	T.	
Burnside	84	26	60.0	1.35	
Challis	91	37	65.8	0.84	
Chesterfield	87[c]	19	54.4[c]	0.45	
Downey	90	19	58.8	0.34	
Fort Sherman	89	36	58.6	2.22	
Gray	87	26	56.5	0.08	
Hagerman	......	......	......	0.05	
Idaho City	90[c]	31[c]	58.6[c]	1.51	
Kootenai	94	31	57.3	3.28	
Lake	80	26	53.0	0.58	
Lakeview	86	41	58.4	2.72	
Lewiston	92	52	68.8	1.42	
Lost River [f]	87	25	60.0	0.36	
Marysville	88	20	56.4	0.34	
Moscow	86	38	57.9	2.39	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Idaho—Cont'd.	°	°	°	*Ins.*	*Ins.*
Murray	82	35	56.0	3.61	
Oakley	95	34	65.2	T.	
Ola	96	35	64.4	1.55	
Paris	91	28	58.6	0.43	
Payette	98	35	66.0	0.74	
Pollock	94	40	62.9	1.69	
Priest River	88	40	61.6	3.21	
St. Maries	90	39	59.7	2.37	
Salubria	95	29	63.3	1.10	
Soldier	91	24	57.2	0.66	T.
Swan Valley	90	24	58.8	1.79	
Weston	94	29	62.2	1.48	
Yellow Jacket	......	......	......	0.85	
Illinois.					
Albion	97	61	78.2	2.10	
Alexander	101	55	78.5	3.92	
Ashton	98	49	73.8	1.29	
Astoria	94	51	74.0	3.00	
Aurora *a*	96	54	75.4	1.84	
Aurora *b*	98	53	75.2	1.52	
Bloomington	102	52	77.4	2.15	
Bushnell	100	54	78.2	4.33	
Cambridge	93	52	74.2	1.78	
Carlinville	100	55	77.9	6.48	
Carlyle	......	......	......	3.33	
Charleston	99	57	77.9	1.41	
Chemung	93	48	71.3	3.05	
Chester	......	......	......	2.29	
Cisne	97	59	77.5	2.48	
Coatsburg	98	55	76.6	4.95	
Cobden	101	62	80.6	1.42	
Danville	101	51	76.0	0.57	
Decatur	100	53	77.5	2.56	
Dixon	99	53	75.4	1.83	
Dwight *[5]	95	53	74.6	2.29	
Effingham	99	59	77.8	2.35	
Elgin	95	54	73.4	1.89	
Equality	97	61	79.0	1.80	
Flora	97	60	77.8	2.57	
Fort Sheridan	96	55	73.8	2.05	
Friendgrove *[1]	96	64	78.3	2.03	
Galva	98	50	75.2	2.40	
Glenwood *[1]	94[d]	60	72.6[d]	1.46	
Grafton	......	......	......	3.31	
Grayville	97	63	80.8	1.05	
Greenville	100	60	78.5	4.73	
Griggsville	99	57	77.5	4.43	
Halfway	98	63	80.8	1.00	
Havana	94	60	77.6	3.26	
Henry	97	50	74.7	1.63	
Hillsboro	100	57	77.5	7.49	
Joliet	94	54	74.4	1.74	
Kankakee	100	55	76.8	2.20	
Knoxville	97	48	73.6	1.14	
Lagrange	93	49	73.0	2.18	
Laharpe	97	55	75.6	4.32	
Lanark	95	44	72.4	1.67	
Loami	......	......	......	3.21	
McLeansboro	97	62	78.6	3.14	
Martinsville	95	59	77.4	2.70	
Martinton	98	49	74.8	2.19	
Mascoutah	99	58	77.8	2.12	
Mattoon	96	60	78.4	4.10	
Minonk	98	50	74.6	1.74	
Monmouth	98	50	75.0	3.27	
Monticello *[5]	99	60	77.8	1.00	
Morrisonville	95	52	75.6	3.84	
Mount Carmel	......	......	......	1.39	
Mount Pulaski	101	56	78.6	3.35	
Mount Vernon	100	58	76.6	2.40	
New Burnside	101	60	81.2	1.42	
Olney	96	60	78.6	2.92	
Oswego	96	51	74.3	2.27	
Ottawa	98	49[d]	74.2[d]	3.02	
Palestine	98	57	76.6	3.12	
Pana	100	55	77.0	2.44	
Paris	98	56	76 6	3.09	
Peoria *a*	......	......	......	1.48	
Peoria *b*	99	57	77.7	1.27	
Philo	98	52	75.4	2.93	
Plumhill	99	60	78.5	1.70	
Rantoul	98	53	75.8	2.61	
Raum	99	66	81.3	3.47	
Riley	96	51	73.8	2.06	
Robinson	97	57	77.5	2.04	
Rockford	94	50	74.6	2.34	
Roundgrove	100	......	......	3.18	
St. Charles *[1]	94	58	71.4	2.10	
St. John	100	60	80.2	2.53	
Savanna	96	44	72.6	2.09	
Scales Mound	92	49	71.8	2.53	
Strawn	......	......	......	0.74	
Streator	96	49	73.4	1.69	
Sullivan	99	54	76.4	2.86	
Sycamore	94	49	72.8	1.39	
Tilden	100	58	78.4	1.64	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Illinois—Cont'd.	°	°	°	*Ins.*	*Ins.*
Tiskilwa	97	52	74.4	1.65	
Tuscola	100	52	76.8	1.95	
Walnut	96	51	75.0	2.95	
Wheaton *[3]	......	61	70.8	1.96	
Winchester	96	57	76.2	2.95	
Winnebago	95	48	72.4	2.57	
Indiana.					
Anderson	93	56	75.8	4.54	
Angola	90	52	75.0	2.77	
Auburn	95	51	72.6	3.73	
Bedford	101	60	79.8	1.71	
Bloomington	97	60	77.1	1.20	
Bluffton	97	52	74.4	2.12	
Booneville	......	......	......	4.90	
Bright	101	58	76.8	4.87	
Butlerville	99	56	76.0	4.49	
Cambridge City	97	54	74.3	4.39	
Columbia City *[1]	92	50	72.6	3.73	
Columbus	99	56	75.2	4.45	
Connersville	97	56	75.1	2.59	
Delphi	97	51	75.0	3.45	
Edwardsville *[1]	93	66	79.4	3.86	
Fairmount	98	52	75.6	1.45	
Farmland	94	53	73.2	1.28	
Fort Wayne	97	53	75.9	6.06	
Greencastle	93	60	76.0	2.10	
Greensburg	98	47	75.6	4.56	
Hammond	92	61	75.5	1.07	
Hector	95	55	75.8	0.90	
Huntington	94	55	77.6	1.64	
Jeffersonville	98	62	78.0	3.94	
Knightstown	100	56	76.3	3.35	
Kokomo	93	56	73.9	3.71	
Lafayette	95	56	75.6	3.45	
Laporte	101	49	76.0	1.07	
Logansport	94	55	74.7	1.19	
Madison	98	58	77.0	3.93	
Marengo	96	57	75.8	4.40	
Marion	95	55	74.8	1.65	
Markle	97	53	74.8	1.10	
Mauzy	98	56	75.0	2.51	
Michigan City *[10]	90	50	69.8	......	
Mount Vernon	98	60	78.6	2.94	
Northfield	95	54	73.7	2.88	
Paoli	95	58	76.8	7.68	
Peru	95	54	74.6	1.84	
Prairie Creek	99[d]	56[d]	77.4[d]	2.34	
Princeton	102	58	78.8	2.85	
Richmond	......	......	......	4.68	
Rockport	99	64	79.7	4.87	
Rockville	96	57	76.7	1.22	
Salem	95	55	75.2	3.75	
Scottsburg	97	61	77.4	3.25	
Seymour	98	60	77.8	2.40	
Shelbyville	99	61	76.8	3.81	
South Bend	96	51	74.4	0.66	
Syracuse	91	52	72.7	1.89	
Terre Haute	98	60	78.6	1.74	
Topeka	88	52	71.3	2.02	
Valparaiso	92	54	74.4	T.	
Vevay	100	58	79.2	6.35	
Vincennes	99	54	79.5	4.08	
Washington	101	60	78.6	6.87	
Winamac	......	......	......	0.57	
Worthington	100	58	78.0	1.30	
Indian Territory.					
Hartshorne	106	65	90.6	0.80	
Healdton	110	65	88.8	0.00	
Kemp	113	72	92.8	0.00	
Lehigh	110	68	87.5	0.18	
Muscogee	105	65	83.4	1.45	
Ryan	107	72	88.2	0.00	
Sapulpa	106	65	84.4	0.80	
South McAlester	......	......	......	0.00	
Tahlequah	......	60	......	2.30	
Tulsa	......	......	......	2.70	
Wagoner	......	......	......	1.65	
Webbers Falls	......	......	......	1.47	
Iowa.					
Afton	96	54	75.4	5.14	
Albia	93	52	74.6	4.49	
Algona *[1]	94	58	74.6	1.12	
Alta *a*	94	53	72.7	2.37	
Amana	93	51	73.9	2.69	
Ames *b*	95	51	74.2	......	
Ames (near)	......	......	......	5.09	
Atlantic	97	48	74.6	4.66	
Audubon	92	55	73.8	5.25	
Batavia	......	......	......	2.43	
Baxter	96	52	74.6	5.40	
Bedford	100	50	76.4	3.54	
Belknap	93	55	75.6	5.33	
Blockton	93	51	75.0	2.19	
Bonaparte	98	55	76.1	2.84	
Britt	96	50	72.7	1.49	
Burlington	98	53	76.8	3.56	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Iowa—Cont'd.	°	°	°	*Ins.*	*Ins.*
Bussey	......	......	......	3.82	
Carroll	96	51	73.4	5.07	
Carson	......	......	......	8.32	
Cedar Rapids	98	54	77.1	1.82	
Centerville	95	56	76.2	3.04	
Chariton	94	53	74.4	4.51	
Charles City	95	48	73.2	5.68	
Clarinda	100	51	77.0	5.03	
Clinton	95	52	73.9	3.91	
College Springs	99	57	76.1	4.19	
Coon Rapids	93	54	74.4	4.06	
Corning	94	52	75.2	3.99	
Council Bluffs	96	59	76.8	6.93	
Cresco	93	48	71.0	4.52	
Cumberland	......	......	......	6.26	
Danville	......	......	......	3.13	
Decorah	99	44	72.8	4.51	
Delaware	94	49	72.5	3.27	
Denison	94	53	73.6	3.49	
Desoto	97	47	75.7	2.61	
Diagonal	94	51	73.8	2.20	
Dows	95	48	72.8	2.34	
Eldon	98	54	77.0	2.75	
Elkader	99	43	73.9	3.10	
Emerson	......	......	......	4.30	
Emmetsburg	......	......	......	3.97	
Estherville	96	48	71.4	2.39	
Fairfield	95	55	74.0	2.66	
Fayette	96	44	72.7	2.33	
Fonda	98	52	75.1	2.49	
Forest City	96	52	73.6	1.52	
Fort Madison	......	......	......	4.11	
Galva	94	51	73.6	3.03	
Gilman	......	......	......	4.17	
Glenwood	96	50	77.2	7.19	
Grand Meadow *[1]	90	52	71.2	5.85	
Greene	98	48	75.2	2.68	
Grinnell (near)	94	54	73.8	3.61	
Griswold	......	......	......	6.58	
Grundy Center	99	48	73.0	3.35	
Guthrie Center [j]	96	52	74.4	4.16	
Hamburg	......	......	......	6.46	
Hampton	100	41	74.2	3.33	
Harlan	94	51	74.2	4.44	
Hawkeye	......	......	......	3.83	
Hedrick	94	52	74.2	3.68	
Hopeville	95	55	74.6	3.44	
Humboldt	96	53	74.2	1.46	
Independence	94	50	72.3	2.55	
Indianola	99	55	75.2	3.83	
Iowa City	97	53	75.2	2.39	
Iowa Falls	96	48	74.2	2.57	
Keosauqua	97	49	75.6	4.05	
Knoxville	92	50	75.2	3.48	
Lacona	......	......	......	3.46	
Lamoni	93	53	74.0	3.87	
Lansing	96	47	71.9	5.00	
Larrabee	93	48	72.4	3.57	
Leclaire	......	......	......	3.00	
Lemars	92	50	73.4	5.51	
Lenox	92	55	74.3	3.58	
Logan	95	55	75.8	5.90	
Maple Valley	......	......	......	2.77	
Maquoketa	93	49	72.6	2.89	
Marshall	96	51	75.4	4.62	
Mason City	96[d]	45[d]	71.0[d]	2.80	
Melrose	......	......	......	4.77	
Monticello	95	50	74.2	1.75	
Mooar	99	55	76.2	3.67	
Mountayr	95	56	75.2	2.12	
Mount Pleasant	97	50	75.2	2.93	
Mount Vernon *b*	96	51	75.4	2.49	
Murray	......	......	......	4.05	
New Hampton	92	48	72.5	3.44	
Newton	93	52	74.0	4.51	
North McGregor	......	......	......	2.84	
Northwood	96	52	72.6	6.31	
Odebolt	99	51	75.4	2.10	
Ogden	95	53	74.1	3.71	
Olin	96	50	74.5	1.88	
Onawa	95	53	76.3	2.48	
Osage	94	47	71.2	5.75	
Osceola	95	52	75.2	2.89	
Oskaloosa	95	52	75.0	3.94	
Ottumwa	98	55	76.2	2.52	
Ovid	95	52	75.8	4.02	
Pacific Junction	95	50	75.0	6.91	
Pella	91	52	72.6	3.36	
Plover	98	50	73.4	1.61	
Primghar	97	49	73.6	2.20	
Redoak	98	54	77.0	5.08	
Ridgeway	95	52	72.7	5.26	
Rockwell City	96	51	74.2	1.85	
Ruthven	97	50	73.4	3.85	
Sac City	95	51	73.4	2.79	
Scranton	95	54	74.6	3.26	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Iowa—Cont'd.	°	°	°	Ins.	Ins.
Sheldon	93	46	71.6	3.97	
Sibley	96	46	71.8	2.20	
Sigourney	99	49	75.2	4.86	
Sioux Center	94	54	73.6	3.72	
Spencer	94	50	73.2	4.21	
Spirit Lake	96	53	73.4	3.22	
Storm Lake	92[e]	51[e]	73.4[e]	2.01	
Stuart	96	54	76.2	2.90	
Tara	100	......	......	1.00	
Thurman	95	52	76.1	10.45	
Toledo	99	47	74.6	3.93	
Villisca	98	50	75.8	3.31	
Vinton *[1]	94	56	74.8	2.55	
Wapello	100	55	75.4	3.39	
Washington	95	50	74.1	2.61	
Washta	......	......	......	3.59	
Waterloo	95	50	73.6	3.59	
Waverly	93	53	73.8	3.66	
Westbend *[1]	94	50	71.4	2.04	
Westbranch	94	55	75.8	3.17	
Whitten *[1]	94	58	73.7	2.78	
Wilton Junction	94	52	74.4	2.72	
Winterset	96	52	75.0	3.27	
Woodburn	......	......	......	3.14	
Kansas.					
Abilene	103	58	80.8	1.16	
Achilles	......	......	......	1.24	
Altoona *[3]	100	66	78.6	2.18	
Anthony	......	......	......	1.00	
Atchison *a*	98	60	78.6	2.89	
Atchison *b* *[1]	100	66	79.8	3.24	
Augusta	103	60	81.6	4.75	
Baker	98	60	79.0	3.60	
Burlington	99	57	80.1	2.26	
Campbell	101	58	78.9	2.91	
Centropolis *[1]	104	64	78.0	4.30	
Chanute	98	59	81.8	0.28	
Colby	107	44	77.4	0.19	
Columbus	98	58	80.0	2.31	
Coolidge	101	47	76.6	3.05	
Cunningham	101	60	82.5	2.20	
Dresden	102	55	77.2	1.31	
Ellinwood	105	60	80.6	1.83	
Emporia	97	64	79.1	4.85	
Englewood	109	58	84.1	0.39	
Eskridge	100	62	80.0	2.79	
Eureka	......	......	......	2.84	
Eureka Ranch	105	52	81.3	0.51	
Fallriver	102	57	81.5	1.11	
Fanning	101	45	76.4	7.78	
Fort Scott	106	58	84.0	1.66	
Frankfort	101	53	78.1	2.15	
Garden City	104	53	80.4	1.00	
Garfield	......	......	......	0.44	
Gibson	106	52	80.0	1.48	
Gove *[1]	104	62	82.3	0.51	
Grenola	104	59	80.7	4.22	
Halstead	105	60	81.6	2.04	
Hays	107	54	80.0	0.55	
Hutchinson	102	64	81.4	1.62	
Independence	102	64	82.4	4.04	
Lawrence	96	62	78.3	3.53	
Lebanon	100[d]	50[d]	79.2[d]	2.00	
Lebo	100	61	80.6	2.07	
Macksville	105	52	80.8	0.62	
McPherson	106	58	81.7	2.60	
Manhattan *b*	103	59	80.4	2.44	
Manhattan *c*	102	55	80.2	2.35	
Marion	104	55	80.6	2.65	
Medicine Lodge	109	61	83.8	0.99	
Minneapolis	106	56	81.5	1.82	
Morantown	99	61	81.1	0.73	
Mounthope *[1]	102	67	81.9	3.48	
Ness City	105	62	82.9	0.67	
Newton	105	65	83.4	1.31	
Norwich	108	63	83.6	1.37	
Oberlin	......	......	......	2.49	
Olathe	101	58	80.5	3.38	
Osage City	99	55	79.6	3.39	
Oswego	102	60	83.6	1.37	
Ottawa	102	55	79.4	2.51	
Paola	102	56	79.8	2.82	
Phillipsburg	106	62	82.4	2.27	
Pratt	104	61	82.1	0.79	
Rome *[1]	105	64	82.0	1.25	
Russell	104	56	81.8	3.11	
Salina	105	61	81.4	3.21	
Scott	103	48	77.2	0.98	
Sedan	103	61	81.4	6.39	
Seneca	101	52	77.5	1.31	
Toronto	101	53	80.2	1.85	
Tribune	102	51	77.9	0.95	
Ulysses	103	51	80.5	1.68	
Valley Falls	106	59	78.8	1.83	
Viroqua	104	53	80.0	0.80	
Wallace	......	......	......	0.48	
Kansas—Cont'd.	°	°	°	Ins.	Ins.
Wamego *[1]	100	61	77.8	2.60	
Winfield	106	63	83.0	1.56	
Kentucky.					
Alpha *[3]	......	64	76.2	1.61	
Bardstown	98	58	78.6	3.26	
Blandville	95	64	79.9	1.47	
Bowling Green *b*	96	66	80.2	2.61	
Burnside	......	......	......	2.23	
Canton *[1]	98	65	80.4	2.66	
Carrollton	99	58	80.0	2.37	
Catlettsburg	96	51	76.2	3.38	
Earlington	99	59	80.0	5.26	
Edmonton	91	59	76.6	1.54	
Ensor	96	62	77.8	4.80	
Eubank	95	54	75.0	1.32	
Falmouth	......	......	......	2.40	
Fords Ferry	99	57	79.4	3.30	
Frankfort	95	60	78.2	3.22	
Georgetown	98	61	77.3	......	
Greensburg	99	51	78.0	1.26	
Henderson	96	63	79.2	4.67	
Hopkinsville	97	62	79.8	3.90	
Irvington	94	59	77.3	2.29	
Jackstown	100	53	75.4	3.95	
Leitchfield	93	59	76.6	3.78	
Loretto	96	54	76.6	3.27	
Marrowbone	95	58	77.2	1.36	
Maysville	102	54	77.2	5.83	
Middlesboro	95	58	75.8	4.56	
Mount Hermon	91	60	76.4	2.01	
Mount Sterling	94	57	76.4	3.35	
Owensboro	98	61	79.2	3.45	
Owenton	96	58	78.0	3.80	
Paducah *a*	......	......	......	3.98	
Paducah *b*	102	66	83.6	2.91	
Princeton	99	61	80.8	3.00	
Richmond	95	56	76.8	3.23	
Russellville	93	62	78.4	2.74	
St. John	93	57	76.0	4.61	
Scott	97	57	76.2	5.25	
Shelby City	97	55	76.2	3.80	
Shelbyville	100	57	79.1	2.44	
Vanceburg	98	55	74.2	4.90	
Williamsburg	97	62	79.7	2.75	
Louisiana.					
Alexandria	103	63	84.3	3.23	
Amite	101	66	83.4	7.56	
Bastrop	104	67	85.6	1.50	
Baton Rouge	99	68	83.3	2.84	
Calhoun	102	65	83.8	2.22	
Cheneyville	103	60	84.5	5.39	
Clinton	100	67	81.8	5.31	
Como	101	66	83.6	0.81	
Covington	99	67	83.2	9.73	
Donaldsonville	96	68	81.4	3.73	
Elm Hall	97	67	83.2	2.17	
Emilie	96	64	80.5	4.50	
Farmerville	100	67	83.0	2.37	
Franklin	99	68	82.8	6.44	
Grand Coteau	102	67	82.9	5.23	
Hammond	100	67	83.0	8.70	
Houma	97	67	83.3	5.70	
Jeanerette	100	65	81.9	7.90	
Jennings	100	67	82.0	5.76	
Lafayette	102	66	82.8	7.27	
Lake Charles	100	67	84.4	4.66	
Lake Providence	99	68	84.0	1.55	
L'Argent	98	68	83.4	2.04	
Lawrence	98	70	83.8	5.37	
Liberty Hill	108	65	85.9	1.92	
Mansfield	104	61	84.5	1.77	
Melville	96	64	82.8	6.28	
Minden	105	64	84.8	3.23	
Monroe	103	68	84.5	2.94	
Montgomery	105	65	86.0	0.95	
New Iberia	97	68	81.8	9.15	
Oakridge	105	68	85.0	2.17	
Opelousas	102	67	83.2	7.06	
Paincourtville	99	67	83.0	7.46	
Plain Dealing	105	61	84.4	0.69	
Plaquemine	101	60	81.8	7.45	
Prevost	102	67	83.4	4.04	
Rayne	101	67	83.2	9.70	
Robeline	102	64	83.7	5.27	
Ruston	104	64	84.3	-1.76	
Schriever	100	65	83.2	4.44	
Shellbeach	98	64	80.0	2.61	
Southern University	95	66	80.5	3.45	
Sugar Ex. Station	96	70	83.0	1.74	
Sugartown	99	67	83.6	6.83	
Venice	94	71	82.0	5.05	
Wallace	98	66	82.2	4.81	
White Sulphur Springs	103	67	84.9	10.61	
Maine.					
Bar Harbor	88	45	62.9	0.75	
Belfast *[6]	83	57	67.8	0.50	
Maine—Cont'd.	°	°	°	Ins.	Ins.
Calais	91	33	64.2	0.78	
Cornish *[1]	91	49	67.1	2.13	
Cumberland Mills	93[c]	45[c]	67.3[c]	1.77	
Fairfield	86	45	65.7	0.46	
Farmington	92	38	65.8	1.91	
Flagstaff	88	32	63.5	0.33	
Gardiner	93	46	68.5	1.08	
Lewiston	97	49	69.0	1.16	
Mayfield	88	41	64.6	1.05	
North Bridgton	95	45	67.8	1.86	
Orono	93	40	66.4	T.	
Petit Menan *[1]	78	50	60.7	......	
Rumford Falls	92	44	66.2	0.64	
Winslow	93	42	66.8	0.25	
Maryland.					
Bachmans Valley	94	46	72.2	4.39	
Boettcherville	101	43	74.4	0.75	
Boonsboro *a*	98	49	75.6	4.44	
Cambridge	92[e]	62[e]	75.8[e]	5.51	
Charlotte Hall[c]	97	57	75.7	5.58	
Chase	95	54	73.6	2.89	
Chestertown	91	57	74.0	4.80	
Chewsville	99	48	74.2	3.85	
Clear Spring	97	52	73.6	3.45	
Coleman	95	57	74.3	5.78	
Cumberland	98	54	77.6	1.28	
Darlington	91	56	73.0	3.75	
Deerpark	90	41	66.6	2.06	
Easton	95	57	74.6	4.25	
Ellicott City	95	53	72.6	4.40	
Fallston	90	56	73.0	4.58	
Frederick	97	52	75.2	3.28	
Frostburg	99	50	72.2	0.96	
Grantsville	90	41	68.1	2.57	
Greatfalls	93	55	74.1	3.13	
Greenspring Furnace	96	52	77.6	3.28	
Hancock	101	45	75.4	3.13	
Harney	......	......	......	4.58	
Jewell	92	59	73.9	5.97	
Johns Hopkins Hospital	97	58	75.1	4.16	
Laurel	98	54	74.7	5.46	
McDonogh	93	56	74.2	2.97	
Mardela Springs	92[b]	58[b]	74.0[b]	5.66	
Mount St. Marys Coll.	99	53	75.2	3.82	
New Market	97	55	75.0	2.57	
Pocomoke City	94	55	75.1	3.97	
Princess Anne	92	56	74.0	2.48	
Queenstown	94[d]	55[d]	73.7[d]	6.88	
Rockhall *a*	94	54	74.4	5.44	
Rockhall *b*	93	56	74.0	5.48	
Sandy Point	102	57	77.1	5.00	
Sharpsburg	95	50	73.8	3.47	
Smithsburg *a*	96	49	74.0	5.06	
Smithsburg *b*	98	52	75.0	5.57	
Solomons	93	64	77.8	3.43	
Sudlersville	92	55	73.2	5.15	
Sunnyside	89	43	67.3	2.47	
Takoma Park	95	52	75.4	7.20	
Taneytown	......	49	......	3.53	
Van Bibber	92	56	73.6	6.48	
Westernport	91	48	71.7	1.70	
Woodstock	90	52	73.3	4.76	
Massachusetts.					
Adams	91	42	67.2	......	
Attleboro	......	......	......	2.05	
Amherst	89	41	67.4	1.89	
Bedford	88	45	66.7	3.43	
Bluehill (summit)	87	49	67.4	1.27	
Cambridge	92	45	68.7	2.59	
Chestnut Hill	92	44	69.2	3.81	
Cohasset	......	......	......	1.22	
Concord	92	41	66.8	3.07	
East Templeton *[1]	90	54	67.2	1.15	
Fallriver	86	54	70.2	1.73	
Fiskdale	......	......	......	1.97	
Fitchburg *a* *[1]	89	52	67.0	2.87	
Fitchburg *b*	91	44	68.5	2.34	
Framingham	95	43	69.2	1.57	
Groton	90	41	66.4	2.12	
Hyannis *[1]	82	49	66.3	1.88	
Jefferson	......	......	......	3.30	
Lawrence	90	49	69.1	2.04	
Leeds	88	40	67.1	3.03	
Leominster	......	......	......	3.25	
Lowell *a*	90	47	69.4	2.11	
Lowell *b*	90	45	67.8	......	
Middleboro	86	41	66.8	1.75	
Monson	88	42	67.5	4.47	
New Bedford *a*	84	51	67.9	2.29	
New Salem	89	47	67.9	2.07	
Pittsfield	86	44	66.6	2.56	
Plymouth *[1]	84	55	67.3	1.28	
Princeton	......	......	......	2.67	
Provincetown	89	55	69.8	0.10	
Salem	......	......	......	2.19	
Somerset *[1]	98	50	72.3	1.41	

TABLE II.—*Climatological record of voluntary and other cooperating observers.*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Massachusetts—Cont'd.	°	°	°	*Ins.*	*Ins.*
South Clinton	......	......	......	3.18	
Springfield Armory	91	48	70.0	1.30	
Sterling				3.54	
Taunton c	86	40	66.8	1.79	
Webster				1.84	
Westboro	91	44	69.6	1.47	
Weston	89	41	67.1	2.54	
Williamstown	88	41	66.2	1.60	
Winchendon				2.91	
Michigan.					
Adrian	95	49	71.8	2.10	
Agricultural College	97	41	71.4	0.70	
Allegan	......	......	......	0.00	
Alma	95	40	69.6	0.47	
Ann Arbor	99	46	72.5	0.51	
Arbela	96	36	68.0	0.45	
Badaxe	94	43	68.9	1.04	
Baldwin	95	38	67.8	1.58	
Ball Mountain	97	48	71.8	0.12	
Baraga	92	......	......	4.32	
Battlecreek	93	48	72.2	3.13	
Bay City	94	47	69.4	0.22	
Berlin	96	38	68.4	0.92	
Berrien Springs	96	48	73.4	0.80	
Big Point Sable *[10]	86	54	67.9	......	
Big Rapids	94	40	68.6	1.11	
Birmingham	97	43	71.6	0.07	
Boon	93	35	64.4	1.15	
Calumet	83	47	64.4	4.33	
Carsonville	97	39	68.8	T.	
Charlevoix	92	45	69.2	0.50	
Cheboygan	93	35	66.8	2.40	
Clinton	98	45	72.6	0.56	
Coldwater	94	46	70.3	1.46	
Eagle Harbor	82	43	64.4	4.19	
East Tawas	85	48	68.1	1.01	
Eloise	97	48	72.3	0.57	
Ewen	87	40	63.6	0.60	
Fairview	93	49	72.0	0.71	
Fitchburg	95	38	69.9	0.06	
Flint	96	38	68.8	0.04	
Frankfort [4]	88	42	66.4	......	
Gladwin	94	39	67.4	0.90	
Grand Rapids	97	48	73.4	0.13	
Grape	98	49	73.7	1.25	
Grayling	94	34	67.5	1.35	
Hanover	97	43	72.6	1.09	
Harbor Beach	94	45	67.8	0.19	
Harrison c	94	42	67.8	1.44	
Harrisville	92	43	66.2	1.64	
Hart	97	44	71.6	0.53	
Hastings	97	41	71.0	0.19	
Hayes	93	42	67.2	T.	
Highland Station	......	......	......	0.89	
Hillsdale	92	45	70.9	1.26	
Holland *[10]	89	53	71.6		
Humboldt	86	30	61.5	5.88	
Ionia	97	41	71.4	0.01	
Iron Mountain	88	42	66.9	3.97	
Iron River	89	34	64.8	3.66	
Ivan	96	43	68.2	2.50b	
Jackson	97	44	72.4	0.38	
Jeddo	96	43	69.6	1.98	
Kalamazoo	96	52	73.0	1.05	
Lake City	94	40	68.2	0.50	
Lansing	95	45	71.6	0.33	
Lapeer	95	34	67.8	0.50	
Lathrop	89	33	64.0	3.14	
Ludington	90	45	67.5	1.26	
Luzerne	95	30	66.4	1.64	
Mackinaw	93	40	66.6	2.37	
Madison	94	51	72.4	1.78	
Mancelona	94	30	67.6	1.60	
Manistee	92	......	......	1.08	
Manistique	83	38	64.2	1.82	
Menominee	93	46	69.7	1.81	
Middle Island *[10]	86	54	67.3	......	
Mottville	98	47	73.0	1.81	
Mount Clemens	98	41	70.7	0.30	
Mount Pleasant	95	39	69.5	0.92	
Muskegon	91	51	71.0	0.36	
Newberry	92	30	65.6	1.17	
North Manitou Island *[10]	95	50	68.2		
North Marshall	96	46	72.4	1.79	
Northport	92	45	68.3	1.05	
Old Mission	96	46	70.6	1.06	
Olivet	90	49	71.0	0.21	
Omer	94	......	......	T.	
Ovid	97	40	70.1	T.	
Owosso	100	41	72.0	0.17	
Plymouth	98	36	70.2	0.64	
Port Austin	94	37	67.0	T.	
Reed City	94	36	67.7	0.85	
Rogers	96	37	65.4	0.93	
Saginaw	96	44	71.4	0.04	
St. Ignace	91	45	65.6	2.01	
Michigan—Cont'd.	°	°	°	*Ins.*	*Ins.*
St. Johns	95	45	71.4	0.03	
St. Joseph	92	50	72.0	1.01	
Sidnaw	90	37	67.8	1.30	
Somerset	93	45	70.4	1.67	
South Haven	93	45	69.8	1.07	
Stanton	97	43	70.6	0.20	
Thomaston	98	......	......	2.28	
Thornville	97	44	71.4	2.38	
Thunder Bay Island *[10]	86	55	67.2	......	
Traverse City	95	47	69.6	0.94	
Vandalia	96	52	73.4	0.83	
Vassar	97	37	68.0	0.27	
Vermilion Point *[10]	88	42	61.9	......	
Wasepi	91	48	70.8	2.63	
Waverly	94	51	74.8	0.82	
West Harrisville	95	40	67.0	1.37	
Wetmore	88	30	63.8	3.53	
White Cloud	96	37	69.6	0.10	
Ypsilanti	94	48	71.2	0.53	
Minnesota.					
Ada	86	39	66.6	4.43	
Albert Lea	96	51	72.4	3.40	
Alexandria	91	44	67.8	9.86	
Ashby	90	45	69.0	8.57	
Beardsley	91	40	69.1	11.62	
Bermidji	88	38	65.4	5.76	
Bird Island	95	48	71.0	5.44	
Blooming Prairie	95	46	70.8	4.00	
Brainerd f	89	41	67.6	9.66	
Caledonia	91	51	69.8	6.26	
Camden	93	46	69.0	4.11	
Campbell	92	37	67.8	5.67	
Collegeville	92	50	69.7	4.80	
Crookston	86	40	65.7	3.32	
Deephaven	......	......	......	3.91	
Detroit City	86	36	65.4	3.86	
Faribault	95	52	71.1	3.96	
Farmington	96	48	70.6	4.73	
Fergus Falls	89	46	67.9	6.08	
Glencoe	93	48	70.4	3.50	
Grand Meadow	98	48	72.1	5.27	
Granite Falls	95	48	70.8	4.56c	
Hallock	88	33	64.0	2.47	
Lake City	97	48	72.3	5.14	
Lake Jennie	94	46	71.2	4.05	
Lakeside	94	51	69.9	3.92	
Lake Winnibigoshish [1]	87	50*	64.7	6.03	
Leech Lake	90	41	66.4	8.64	
Leroy	92	48	72.2	5.21	
Long Prairie	92	41	67.5	9.35	
Luverne	92	49	70.8	4.23	
Lynd	97	46	71.2	4.43	
Mapleplain [1]	98	52*	70.6	3.13	
Milaca	94	45	68.0	6.66	
Milan	94	48	70.0	6.80	
Minneapolis a	96	52	71.4	3.45	
Minneapolis b [1]	95*	51	70.6	3.20	
Minnesota City *[1]	92	56	72.3	4.70	
Montevideo	96	45	70.2	......	
Morris	94	45	69.6	11.68	
Mount Iron	84	44	64.3	4.56	
Newfolden	85	37	63.5	2.42	
New London	94	48	69.8	4.36	
New Richland *[1]	94	58	72.2	......	
New Ulm	102	50	72.6	3.73	
Park Rapids	88	43	64.4	8.59	
Pine River	91	43	65.1	10.32	
Pipestone	......	49	......	3.66	
Pleasant Mounds	94	53	71.6	4.33	
Pokegama Falls	89	38	64.0	8.13	
Redwing	......	......	......	4.50	
Reeds	......	......	......	5.10	
Rolling Green	92	52	71.2	2.91	
Roseau f	85	33	61.9	1.28	
St. Charles	96	40	70.8	3.12	
St. Cloud	90	50	69.2	7.91	
St. Peter	91	54	71.0	3.29	
Sandy Lake Dam	88	44	65.4	9.78	
Shakopee	95	53	73.2	3.62	
Tower	84	40	64.2	5.40	
Two Harbors	86	42	62.6	5.63	
Wabasha *[1]	94	58	72.1	6.01	
Willmar	92	49	68.7	5.78	
Willow River	92	45	67.0	6.81	
Winnebago City	96	50	72.6	3.59	
Worthington	89	48	70.2	4.33	
Mississippi.					
Aberdeen	100	66	80.8	3.85	
Agricultural College	96	69	82.1	3.85	
Americus	101	67	83.2	4.99	
Austin	96	65	81.0	3.90	
Batesville	96	64	80.8	3.48	
Bay St. Louis	101	70	83.2	8.03	
Biloxi	93	63	78.6	4.04	
Booneville	97	67	79.8	1.45	
Briers	......	......	......	2.25	
Mississippi—Cont'd.	°	°	°	*Ins.*	*Ins.*
Brookhaven	101	64	83.4	3.95	
Canton	101	65	82.4	2.79	
Columbus a	......	......	......	6.26	
Columbus b	95	70	82.0	6.16	
Corinth	104	68	82.2	1.95	
Crystal Springs	101	64	83.2	2.50	
Edwards	99	67	83.6	5.84	
Fayette	99	65	82.4	5.60	
Fayette (near) *[1]	99	70	83.7	......	
Greenville a	97	67	82.6	0.83	
Greenville b	99	69	84.2	0.87	
Greenwood	97	68	82.7	2.78	
Hattiesburg	96	69	83.8	1.84	
Hazlehurst	......	65	......	0.80	
Hernando	97	60	80.6	4.46	
Holly Springs	98	68	81.8	3.68	
Jackson	101	68	84.0	1.89	
Lake	96	63	79.8	4.05	
Leakesville	101	65	82.7	2.38	
Logtown	97	68	82.2	5.48	
Louisville	99	66	81.2	5.31	
Macon	102	63	82.8	2.46	
Magnolia	98	65	82.6	5.21	
Natchez	100	69	84.6	1.60	
Okolona	104	62	83.8	1.47	
Palo Alto	98	68	82.7	5.43	
Port Gibson	100	65	83.8	4.00	
Stonington *[1]	96	70	82.2	......	
Thornton	......	......	......	1.10	
Tupelo	......	......	......	3.02	
University	99	66	81.8	3.16	
Water Valley *[1]	104	68	80.8	1.91	
Waynesboro	96	65	81.3	6.54	
Westpoint	107	68	84.8	......	
Windham	99	64	82.0	8.66	
Woodville	100	65	82.7	6.46	
Yazoo City	105	65	84.8	2.69	
Missouri.					
Appleton City [1]	107*	61	80.1	2.00	
Arthur *[3]	......	69	79.6	1.00	
Avalon	98	56	76.8	4.35	
Bethany	100	51	76.8	3.11	
Birchtree	98	60	78.6	2.47	
Boonville	......	......	......	3.65	
Brunswick	95	60	76.4	3.25	
Carrollton	96	62	78.6	5.21	
Conception	94	60	75.8	3.59	
Cook Station	101	53	78.2	1.67	
Cowgill *[5]	96	62	79.4	3.96	
Darksville	99	60	76.9	2.60	
East Lynne *[3]	104	60	75.4	3.04	
Edgehill *[5]	94	62	78.4	3.63	
Eldon	98	56	78.0	4.29	
Elmira	99	58	79.0	4.01	
Fairport	......	......	......	2.63	
Fayette	99	59	77.6	3.93	
Fulton	......	......	......	3.47	
Galena	......	......	......	1.38	
Gallatin *[1]	98	56	77.7	3.80	
Gayoso	100	62	81.9	1.83	
Glasgow	97	60	78.2	3.68	
Gorin	......	......	......	2.96	
Halfway	101	55	81.0	1.59	
Harrisonville	99	58	79.4	3.11	
Hazlehurst	......	......	......	3.88	
Hermann	......	......	......	4.06	
Houston	101	55	78.8	1.32	
Houstonia (near)	......	......	......	6.56	
Irena	......	......	......	3.10	
Ironton	101	54	79.3	2.54	
Jackson *[3]	92	68	79.0	1.16	
Jefferson City	104	59	79.3	3.96	
Kidder	96	56	76.9	3.49	
Lamar	104	57	82.7	1.69	
Lebanon	100	62	81.3	1.57	
Lexington	101	58	78.8	6.15	
Liberty	100	54	77.8	4.03	
Louisiana	101	55	77.3	6.85	
McCune *[1]	98	63	77.2	4.69	
Marblehill	102	56	79.4	1.29	
Marshall	98	59	77.4	3.61	
Maryville	97	57	76.2	3.36	
Mexico	102	59	79.6	2.51	
Miami *[5]	99	62	79.2	4.48	
Mineralspring	96	57	77.8	0.20	
Montreal	99	57	79.2	2.97	
Mount Vernon	105	60	83.9d	1.42	
Neosho	99	55	79.9	1.44	
Nevada	102	54	80.9	1.74	
New Haven	100	62	80.0	2.72	
New Madrid	101	65	83.0	4.57	
New Palestine	102	59	78.0	6.24	
Oakfield	97	62	79.6	4.42	
Olden	98	60	78.2	1.58	
Oregon a	97	59	77.4	6.26	
Oregon b	98	60	78.8	6.11	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	*Ins.*	*Ins.*
Missouri—Cont'd.					
Phillipsburg*[1]	104	68	79.8	1.87	
Pickering*[3]	101	60	77.0	4.09	
Poplarbluff	98	62	81.4	1.88	
Potosi	97	49	74.2	1.83	
Princeton	100	54	78.6	3.93	
Rhineland	100	58	78.6	2.28	
Rolla	......	......	......	1.6	
St. Joseph	......	......	......	3.17	
Sarcoxie*[3]	104	66	79.8	1.30	
Sedalia	101	59	78.2	4.10	
Seymour	99	60	78.6	2.26	
Shelbina	......	......	......	5.70	
Sikeston	100	62	80.6	3.73	
Steffenville	94	58	76.6	6.17	
Stellada	100	61	79.2	3.74	
Sublett	94	55	75.7	5.00	
Trenton	......	......	......	4.06	
Unionville	102	58	80.1	4.27	
Vichy	102	64	80.6	3.86	
Warrenton	101	60	79.1	3.26	
Wheatland	......	......	......	1.45	
Willow Springs	100	61	80.1	3.13	
Wylie	99	60	80.6	1.79	
Zeitonia	100	59	80.6	1.93	
Montana.					
Adel	82	27	54.4	0.71	
Billings	92	44	67.3	T.	
Boulder	84[c]	33[c]	57.2[c]	1.71	
Butte	78	38	58.6	2.35	T.
Canyon Ferry	87	43	62.8	1.85	T.
Chinook	83	40	62.4	2.41	
Columbia Falls	86	31	57.2	3.44	
Corvallis	88	35[f]	63.8[e]	0.12	
Crow Agency	92	40	66.5	0.71	
Dearborn Canyon	82	36[k]	57.0[f]	1.42	
Deer Lodge	88	29	58.3	......	
Dell	88	31	58.0	0.04	
Fort Benton	93[b]	41[e]	63.1[c]	0.76	
Fort Keogh	98	43	70.0	0.91	
Fort Logan	84	34	57.2	1.00	
Glasgow	93	40	66.0	0.25	
Glendive	98	44	69.0	0.70	
Glenwood	84	34	57.8	2.08	
Greatfalls	87	41	62.3	1.10	T.
Kipp	90	31	58.6	2.50	
Manhattan	85	33	59.8	0.55	T.
Martinsdale	91	34	60.0	0.82	
Marysville	81	35	57.0	0.57	......
Missoula	91	39	61.2	1.96	
Ovando	89	26	54.3	1.19	
Parrot	85	38	61.2	1.32	
Plains	86	40	59.8	0.07	
Poplar	95	43	68.2	0.35	
Red Lodge	88	32	59.4	......	
Ridge	96	38	66.3	1.29	
St. Pauls	87	36	61.6	1.39	
Troy	90	34	58.6	2.30	
Utica	84	36	59.8	1.31	
Wibaux	86	42	64.8	1.53	
Yale	86	34	61.0	0.14	
Nebraska.					
Agee*[1]	96	54	71.7	6.95	
Albion	95	43	73.6	3.76	
Alliance	......	......	......	1.70	
Alma*[1]	102	48	76.2	0.74	
Ansley	99	38	73.8	3.23	
Arapaho	......	......	......	0.55	
Arborville*[1]	104	60	76.3	2.17	
Ashland *a*	97	53	76.6	4.31	
Ashland *b**[1]	100	56	77.6	4.49	
Ashton	......	......	......	2.89	
Auburn	99	50	77.2	5.28	
Aurora*[1]	104	51	78.0	2.63	
Bartley	......	......	......	1.55	
Beatrice	98	54	76.4	4.16	
Beaver City	107	42	78.4	1.45	
Bellevue	......	......	......	5.48	
Benedict	......	......	......	4.50	
Benkleman	......	......	......	2.73	
Blair	95	54	74.3	6.18	
Bluehill	......	......	......	1.42	
Bradshaw	......	......	......	3.59	
Brokenbow	......	......	......	2.82	
Burwell	......	......	......	3.26	
Callaway	103	37	75.6	1.85	
Camp Clarke	108	43	74.0	2.12	
Central City	......	......	......	2.21	
Chester	......	......	......	2.80	
Clatonia	100	55	79.1	4.65	
Cody	......	......	......	0.09	
Columbus	94	48	73.8	4.03	
Creighton	97	40	71.9	4.73	
Crete	99	51	75.4	6.59	
Culbertson	......	......	......	3.24	
Curtis *a*	105	41	75.8	2.55	
David City	98	53	75.4	6.45	
Nebraska—Cont'd.					
Dawson	102	54	78.0	4.76	
Eden	......	......	......	5.97	
Edgar *a**[5]	104	54	84.2	1.35	
Elba	......	......	......	5.36	
Ericson	......	......	......	2.49	
Ewing	......	......	......	3.78	
Fairbury	104	54	77.4	2.98	
Fairfield	106	49	79.5	0.85	
Fairmont	103	47	77.4	2.88	
Fort Robinson	98	44	71.4	1.55	
Franklin	104	45	78.0	2.65	
Fremont	96	50	74.2	9.78	
Geneva	100	46	74.5	2.05	
Genoa	99	50	75.6	4.62	
Gering	97	43	71.0	2.24	
Gordon	......	......	......	2.40	
Gothenburg	103	42	73.3	1.93	
Grand Island *a*	......	......	......	3.78	
Grand Island *b*	103	43	76.6	3.78	
Grand Island *c*	100	46	77.5	2.64	
Greeley	......	......	......	3.25	
Haigler	......	......	......	1.31	
Hartington	98	46	73.2	3.10	
Harvard	99	50	76.6	3.84	
Hastings*[1]	97	54	76.4	3.51	
Hayes Center	......	......	......	2.18	
Hay Springs	101	42	71.4	1.47	
Hebron	99	54	76.9	2.43	
Hickman	......	......	......	3.80	
Hooper*[1]	92	52	74.7	4.95	
Hubbard	......	......	......	4.10	
Imperial	107	40	75.8	0.93	
Johnstown	......	......	......	7.11	
Kearney	......	......	......	5.10	
Kennedy	97	31	70.6	5.19	
Kimball	98	47	70.4	1.42	
Kirkwood*[1]	95	54	70.4	6.58	
Lexington	98	37	73.6	2.39	
Lincoln *b*	97	54	77.0	2.51	
Lincoln *d*	99	52	78.0	2.18	
Lodgepole	98	43	71.2	0.55	
Loup*[1]	100	40	76.0	3.11	
Lynch	99	43	73.0	9.25	
Lyons	......	......	......	2.90	
McCook	......	......	......	2.90	
McCool	......	......	......	2.24	
Madison	95	47	74.0	3.23	
Madrid*[5]	102	44	76.6	0.99	
Marquette	......	......	......	2.56	
Merriman	......	......	......	0.10	
Minden *a*	100	45	76.4	2.89	
Minden *b*	......	......	......	2.41	
Monroe	......	......	......	4.80	
Nebraska City *b*	......	......	......	5.50	
Nebraska City *c*	99	52	76.2	4.97	
Nemaha*[1]	105	62	77.8	5.80	
Nesbit	97	40	71.2	2.70	
Norfolk *b*	96	44	73.8	2.98	
North Loup	......	......	......	3.50	
Oakdale	100	43	74.3	2.18	
Odell	......	......	......	4.84	
O'Neill	99	42	71.3	4.02	
Ord	......	......	......	2.03	
Osceola	......	......	......	3.57	
Ough	......	......	......	2.08	
Palmer *b*	......	......	......	3.29	
Palmyra	......	......	......	4.72	
Paxton	......	......	......	1.87	
Plattsmouth *b*	......	......	......	3.35	
Pleasant Hill	......	......	......	4.36	
Ravenna *a*	98	40	74.8	5.33	
Ravenna *b*	......	......	......	4.62	
Redcloud *a*	......	......	......	2.29	
Republican*[1]	98	56	76.8	0.70	
Rulo	......	......	......	8.00	
St. Libory	......	......	......	3.21	
St. Paul	......	......	......	5.55	
Salem*[1]	98	60	76.7	5.55	
Santee	104	48	75.5	4.80	
Sargent	......	......	......	3.71	
Schuyler	......	......	......	8.19	
Seneca*[1]	92	52	72.4	0.25	
Seward*[1]	97	50	75.2	3.89	
Spragg	......	......	......	5.78	
Springview	92	48	70.4	3.68	
Stanton*[1]	94	48	71.9	3.61	
State Farm	100	47	77.4	2.34	
Strang	......	......	......	1.95	
Stratton	......	......	......	2.04	
Superior*[5]	102	58	80.5	2.05	
Syracuse	......	......	......	4.28	
Tablerock	......	......	......	5.41	
Tecumseh *b*	100	50	75.6	5.54	
Tecumseh *c*	......	......	......	5.81	
Tekamah	96	50	74.8	3.03	
Thedford	......	......	......	3.03	
Nebraska—Cont'd.					
Turlington	97	54	75.7	5.37	
Valentine	96	48	74.6	2.59	
Valparaiso	......	......	......	3.64	
Wakefield	97	45	74.2	3.31	
Wallace	......	......	......	0.60	
Wauneta	......	......	......	1.35	
Weeping Water*[1]	96	51	72.5	3.50	
Westpoint	94	49	76.4	3.96	
Whitman	......	......	......	4.58	
Wilber*[1]	104	56	74.9	6.61	
Willard	......	......	......	1.24	
Wilsonville*[1]	100	46	78.1	1.45	
Wisner	......	......	......	2.59	
Wymore*[1]	98	60	77.5	5.54	
York*[1]	101	55	76.4	2.64	
Nevada.					
Battle Mountain*[1]	95	29	70.0	0.81	
Beowawe*[1]	98	50	64.6	......	
Candelaria	91	41	66.6	1.35	
Carlin*[1]	90	45	66.5	0.35	
Carson City	87	35	61.0	0.65	
Clover Valley	......	......	......	1.17	
Cranes Ranch	......	......	......	1.60	
Elko*[1]	92	38	57.4	1.95	
Elko (near)	89	30	60.4	3.10	
Ely	88	32	61.4	1.50	
Empire Ranch	99	34	63.4	0.22	
Fenelon*[1]	......	......	......	0.60	
Golconda*[1]	86	36	60.2	0.50	
Halleck*[1]	98	34	60.2	0.25	
Hawthorne *b*	89	45	68.2	0.22	
Hot Springs	......	......	......	T.	
Humboldt*[1]	85	46	68.2	0.13	
Lee	......	......	......	1.41	
Lewers Ranch	85	33	60.9	1.21	
Los Vegas	98	47	71.4	0.00	
Lovelocks*[1]	87	55	68.9	0.00	
Martins	82	33	58.5	0.73	
Mill City*[1]	94	38	66.4	0.00	
Monitor Mill	89	36	62.0	1.56	
Palisade*[1]	92	45	65.4	1.17	
Palmetto	89	32	61.2	0.96	T.
Reno State University	85	38	62.7	1.37	
Sodaville	94	44	70.4	0.75	
Tecoma*[1]	95	40	63.2	T.	
Toano*[1]	90	45	65.1	T.	
Tuscarora	83	31	59.5	0.80	
Tybo	89	......	......	2.32	
Verdi*[1]	92	45	62.2	1.60	
Wadsworth*[1]	96	38	60.6	0.05	
Wells	88	20	59.3	0.56	
New Hampshire.					
Alstead*[6]	87	45	70.9	1.24	
Berlin Mills	91	35	66.7	0.76	
Bethlehem	87	41	65.0	1.02	
Brookline*[1]	93	40	66.9	2.39	
Claremont	97	37	69.2	2.42	
Concord	91	38	66.9	1.93	
Durham	93	45	66.6	1.00	
Grafton	91	32	63.9	1.48	
Hanover	94	37	66.6	2.61	
Keene	90	37	66.9	1.78	
Littleton	90	40	65.0	0.97	
Nashua	94	42	68.5	2.25	
Newton	90	39	65.8	1.67	
North Conway	95	39	66.8	2.35	
Peterboro	91	36	65.4	2.57	
Plymouth	93	37	67.2	2.87	
Sanbornton	91	40	66.0	1.60	
Stratford	99	35	66.2	0.67	
Warner	......	......	......	1.50	
New Jersey.					
Asbury Park	89	56	71.2	3.32	
Bayonne	95	53	73.8	4.66	
Belvidere	95	43	70.4	5.91	
Bergen Point	92	56	72.9	5.88	
Beverly	96	51	74.0	4.40	
Billingsport*[1]	92	63	74.0	5.14	
Boonton	94	45	69.7	2.81	
Bridgeton	95	56	75.4	6.74	
Camden	90	54	72.8	5.32	
Cape May C. H.	94	55	74.0	2.38	
Charlotteburg	92	39	67.9	3.60	
Chester	94	46	69.8	2.79	
Clayton	94	54	73.6	2.92	
College Farm	95	51	72.2	3.45	
Deckertown	93	44	70.4	3.70	
Dover	99	44	71.2	3.22	
Egg Harbor City	95	53	72.3	7.22	
Elizabeth	95	52	73.4	3.98	
Englewood	93	51	72.6	4.14	
Flemington	98	49	72.9	3.18	
Freehold	87	48	70.4	2.21	
Friesburg	94	55	73.4	6.43	
Hammonton	......	......	......	4.30	
Hanover	90	46	70.2	3.00	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
New Jersey—Cont'd.	°	°	°	Ins.	Ins.
Hightstown	93	53	72.8	3.20	
Imlaystown	96	53	74.4	3.80	
Lambertville	95	48	73.7	4.37	
Lebanon				4.35	
Moorestown	94	52	72.8	5.32	
Mount Pleasant				5.98	
Newark	94	51	71.8	4.92	
New Brunswick	95	50	74.2	4.39	
Newton	97	44	71.2	3.30	
Ocean City	88	54	70.8	4.64	
Oceanic	87	58	71.7	2.16	
Paterson	95	53	72.7	2.79	
Perth Amboy	94	54	73.1	4.14	
Plainfield	94	47	72.0	3.40	
Port Norris	94	53	73.4	2.97	
Rancocas				4.92	
Rivervale	91	43	70.3	3.25	
Roseland	94	45	69.9	4.15	
Salem	99	51[f]	74.4[e]	7.98	
Somerville	97	49	73.6	3.25	
South Orange	91	52	71.4	5.04	
Staffordville				6.86	
Toms River	96	47	71.2	2.98	
Trenton	94	55	74.7	5.19	
Tuckerton	90	55	71.6	9.70	
Vineland	94	54	73.6	6.82	
Woodbine	92	55	72.7	3.24	
New Mexico.					
Albert	100	60	80.3	0.38	
Albuquerque	94	54	75.3	0.63	
Alma	97	48	73.3	1.75	
Aztec	92	46[h]	68.8[f]	3.30	
Bell Ranch				0.11	
Bernalillo	95	50	74.9	0.64	
Bluewater	93	44	69.3	1.00	
Cambray				0.64	
Clayton	93	57	74.8	0.00	
Deming				0.78	
East Lasvegas	89	48	70.4	0.17	
Eddy	109	62	83.6	T.	
Engle	96	55	75.8	0.40	
Espanola	97	43	71.6	0.94	
Folsom	93	44	70.0	0.27	
Fort Bayard	94	50	72.6	1.30	
Fort Union	92	44	68.7	0.52	
Fort Wingate	93	48	69.6	1.25	
Gage				1.00	
Galisteo	100	50	72.2	0.70	
Gallinas Spring	96	54	75.7	0.17	
Gila	99	55	77.6	1.26	
Hillsboro	96	55	75.4	0.74	
Las Vegas Hotsprings	92[e]	50	69.8[e]	0.34	
Lordsburg				0.50	
Lower Penasco	93[h]	56[h]	72.9[h]	1.35	
Mesilla Park	99	51	75.6	1.81	
Monero	89	32	62.0	1.99	
Raton	92	50	69.4	0.25	
Rincon	99	59	78.5	1.54	
Roswell	103	57	78.8	1.21	
San Marcial	97	53	76.0	2.34	
Socorro	96	56	77.1	0.30	
Strauss				0.44	
White Oaks	91	51	73.6	1.72	
Winsors Ranch	86	28	57.2	0.52	
New York.					
Adams				0.92	
Addison	93	40	69.3	2.90	
Akron				1.33	
Alfred	94	38	66.0	1.21	
Angelica	92	37	67.2	2.05	
Appleton	90	44	68.9	0.38	
Arcade	92	43	68.8	0.45	
Atlanta				3.14	
Auburn	98	45	72.6	2.52	
Avon	96	40	70.6	0.59	
Baldwinsville				3.08	
Bedford *a*	88	42	68.4	0.89	
Bedford *b*				0.80	
Bolivar	92	34	66.2	1.72	
Bouckville	92	42	67.6	1.97	
Boyds Corners				0.48	
Brentwood	86	47	69.6	2.80	
Caldwell	91	45	69.5	0.91	
Canton	95	36	67.9	0.61	
Carmel	89	52	72.0	0.53	
Carvers Falls	95	40	68.8	1.13	
Catskill	90	47	71.0	2.21	
Cedarhill	97	44	73.6	2.17	
Charlotte*[10]	91	48	69.8		
Chenango Forks				2.95	
Cherry Creek				0.44	
Cooperstown	90	43	66.6	2.72	
Cortland	94	39	68.2	2.64	
Cutchogue	88	49	70.2	0.75	
Dekalb Junction				0.77	
Dryden	94	38	67.9	2.39	
New York—Cont'd.	°	°	°	Ins.	Ins.
Easton				1.76	
Elmira	99	45	71.8	3.16	
Fayetteville				2.92	
Fleming	95	51	71.0	2.75	
Fort Niagara	95	45	69.0	1.80	
Franklinville	95	36	67.0	1.54	
Fulton				1.91	
Garrattsville	91	40	66.3	0.52	
Glens Falls	92	46	70.7	1.95	
Gloversville	94	39	68.2	1.66	
Greenwich	93	43	69.8	1.37	
Haskinville				1.85	
Hemlock	91	42	70.2	0.95	
Honeymead Brook	88	45	68.4	1.81	
Hopewell	92	41	70.8	0.83	
Humphrey	93	47	70.2	1.26	
Ithaca	98	43	71.4	2.31	
Jamestown	88	47	69.1	2.75	
Keene Valley	91	37	64.3	1.45	
King Station				3.89	
Lake Hill	86	42	66.1	2.19	
Liberty	90	48	67.6	3.35	
Littlefalls	95	44	68.4	1.35	
Lockport	92	47	69.5	0.48	
Lowville	94	39	67.6	0.73	
Lyndonville				0.50	
Lyons	92	47	71.0	1.49	
Madison Barracks	93	40	69.0	0.10	
Mayle				1.56	
Middletown	90	50	69.8	2.23	
Mohonk Lake[1]	88*	51	68.9	1.52	
Mount Morris	98	35	68.7	0.05	
Newark Valley				3.52	
New Lisbon	93	35	65.0	3.49	
North Germantown	89	49	70.6	1.91	
North Hammond	96	46	72.2	0.82	
North Lake	91	38	64.8	3.19	
Number Four	91	35	64.4	0.81	
Nunda	100	40	71.4	2.03	
Ogdensburg	93	50	70.7	0.83	
Oneonta	94	39	66.8	2.72	
Oxford	94	37	67.4	3.20	
Palermo	96	39	68.8	1.09	
Penn Yan	99	42	72.2	1.24	
Perry City	97	38	68.5	0.96	
Phenix				4.49	
Pine City				4.84	
Plattsburg Barracks	91	35	66.2	5.28	
Port Byron	92	41	69.2	4.20	
Port Jervis	91	44	69.5	2.18	
Poughkeepsie	94	43	69.8	0.16	
Primrose	92	46	70.7	1.20	
Richmondville	92	43	67.6	1.20	
Ridgeway	94	47	70.6	0.55	
Rome	94	43	69.2	1.55	
Romulus	97	46	71.8	1.80	
Rose				1.49	
St. Johnsville	95	41	69.2	1.13	
Salisbury Mills	89			1.29	
Saranac Lake	92	33	62.6	1.85	
Saratoga Springs	90	44	68.6	2.20	
Schenectady	95	47	71.4	4.93	
Schenevus				4.50	
Scottsville				0.24	
Setauket	88	52	70.6	0.97	
Sherwood				3.09	
Skaneateles				3.39	
South Canisteo	94	38	67.6	1.99	
Southeast Reservoir				0.32	
South Kortright	92	35	66.0	2.19	
Straits Corners	98			3.25	
Volusia	86	49	67.9	2.18	
Wappingers Falls	91	48	70.9	1.68	
Warwick				3.36	
Watertown	95	41	71.0	0.93	
Waverly	96	36	70.0	5.23	
Wedgwood	98	47	71.9	2.55	
West Berne	92	52	72.4	2.19	
West Chazy	93	44	67.2		
Westfield *a*	89	45	69.1	1.18	
Westfield *c*	87	52	70.8	0.88	
Westpoint	92	41	68.4	1.90	
Willetspoint	98	54	72.8	1.80	
Williamson				1.27	
North Carolina.					
Asheville				2.87	
Biltmore	95	55	75.2	3.37	
Bryson City				5.53	
Chapel Hill	100	64	79.8	1.34	
Currituck				4.21	
Durham				1.80	
Edenton	98	63	78.8	9.48	
Experimental Farm	94	65	79.1	2.50	
Fairbluff				5.89	
Fayetteville	96	62	79.4	3.76	
Flatrock	90	52	72.4	6.58	
North Carolina—Cont'd.	°	°	°	Ins.	Ins.
Goldsboro	97	62	78.6	5.37	
Greensboro	96	63	77.5	1.42	
Greenville	95	65	78.7	6.54	
Henderson	96	63	77.9	1.36	
Hendersonville	94	56	74.4	5.40	
Horse Cove	92	57	73.8	6.92	
Lenoir*[1]	92	63	76.6	5.71	
Linville	82	47	66.8	5.60	
Littleton	97	58	76.4	2.73	
Louisburg	97	61	78.2	3.49	
Lumberton	97	67	80.6	3.81	
Mana				2.05	
Marion	100	59	77.8	5.64	
Marshall	92	51	74.6	3.43	
Mocksville	100	64	78.8	1.57	
Moncure	95	65	78.8	2.56	
Monroe	98	63	79.2	2.97	
Morganton	99	59	78.2	4.14	
Mountairy	95[c]	58[c]	75.2[c]	4.05	
Mount Pleasant	98	64	80.3	2.19	
Murphy				3.09	
Newbern	100	61	80.0	7.61	
Oakridge	100	60	78.0	1.12	
Pantego				12.60	
Patterson*[1]	96	55	73.4	5.38	
Pittsboro	98	62	78.4	4.55	
Rockingham	102	66	81.6	1.20	
Roxboro	97[d]	52[d]	74.8[d]	1.44	
Salem	98	63	78.6	2.24	
Salisbury	100	62	80.7	1.94	
Saxon	102	62	78.8	1.35	
Selma	100	66	80.3	5.55	
Settle	100	60	78.5	1.32	
Sloan	98	65	77.9	8.22	
Soapstone Mount	99	61	77.8	0.65	
Southern Pines *a*	102	65	81.0	1.76	
Southern Pines *b*	97	65	79.8	2.39	
Southport	97	63	81.5	5.19	
Springhope*[1]	95	65	77.2	3.46	
Tarboro	100	62	79.6	4.69	
Waynesville	89	51	70.5	3.27	
Weldon *a*	95	64	77.6	2.59	
Weldon *b*				2.89	
North Dakota.					
Ashley	90	39	66.5	3.02	
Berlin[1]	91*	40	62.5	3.87	
Buxton	87	38	64.8	2.44	
Churchs Ferry	88	39	64.0	3.86	
Coal Harbor	88	43	64.5	0.86	
Devils Lake	87	40	65.1	4.04	
Dickinson	90	41	65.4	3.41	
Donnybrook	89	32	59.5	1.15	
Dunseith	90	38	62.6	3.06	
Ellendale	93	45	68.4	4.55	
Fargo	89	37	67.2	3.71	
Forman	88	42	71.0	6.25	
Fort Berthold	94	42	68.8	1.82	
Fort Yates	90	44	68.4	3.15	
Fullerton[1]	93*	38	63.9	7.80	
Gallatin	91	35	66.7	2.39	
Grafton	87	36	62.6	2.25	
Hamilton	88	32	62.3	2.36	
Hannaford	89	42	66.7	1.00	
Langdon	85	39	60.1	3.37	
Larimore	89	34	64.3	2.81	
Lisbon	92	43	67.8	4.27	
McKinney	91	33	61.0	1.34	
Mayville	88	46	66.5	2.01	
Medora	97	40	68.0	2.36	
Melville	87			0.24	
Milton	83	40	60.5	3.85	
Minnewaukon	86	38	63.6	2.56	
Minot	88	38	63.2	5.20	
Minto	95	32	65.5	1.76	
Napoleon	89	39	66.2	3.82	
Oakdale	87	38	63.8	0.65	
Pembina	90	34	63.8	1.81	
Portal	90	38	62.4	1.26	
Power	86	40	65.6	2.92	
Sheyenne				2.60	
Steele	88	42	65.8	3.74	
Towner	89	39	62.6	4.09	
University	85	40	65.2	1.55	
Wahpeton	90	43	69.2	5.57	
Washburn	90	39	65.8	0.56	
Willow City	88	39	62.8	3.19	
Woodbridge	84	32	61.2	2.78	
Ohio.					
Akron	96	49	72.4	2.58	
Ashland	96	47	74.3	1.13	
Ashtabula	91	50	70.4	0.50	
Atwater				1.84	
Bangorville	94	48	73.0	2.43	
Bellefontaine	93	60	76.0	1.15	
Bement				1.51	
Benton Ridge	95	51	73.2	0.66	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Ohio—Cont'd.	°	°	°	*Ins.*	*Ins.*
Bethany	102	57	78.3	4.24	
Bigprairie	94	49	73.0	0.80	
Binola	......	......	......	0.58	
Bladensburg	93	47	70.6	2.08	
Bloomingburg	96	55	76.0	1.25	
Bowling Green	95	48	72.3	0.75	
Bucyrus	94	50	73.8	0.40	
Cambridge	93	45	70.6	1.05	
Camp Dennison	97	58	76.4	2.36	
Canal Dover	98	47	72.4	1.28	
Canton	94	49	72.6	1.14	
Carrolton	97[c]	45[c]	73.1[c]	1.06	
Cedarville	......	......	......	0.78	
Chillicothe	97	54	75.7	0.95	
Circleville	96	53	73.2	0.32	
Clarksville	96	57	75.8	3.36	
Cleveland *a*	88	52	70.8	0.89	
Cleveland *b*	90	52	71.2	1.11	
Coalton	90	49	74.7	1.67	
Colebrook	94	43	69.2	0.45	
Dayton *a*	98	54	76.6	1.30	
Dayton *b*	......	......	......	1.94	
Defiance	94	50	72.6	1.77	
Delaware	95	49	73.6	2.70	
Demos	92	52	72.4	1.79	
Dupont	90	52	71.4	5.40	
Elyria	97	49	72.6	1.16	
Findlay	98	52	75.4	0.79	
Frankfort	92	51	72.6	1.79	
Garrettsville	97	42	70.1	2.10	
Granville	94	......	......	1.95	
Gratiot	93	51	72.4	1.16	
Greenfield	95	58	76.2	2.55	
Greenhill	95	43	70.6	1.38	
Greenspring	94	53	75.7	0.82	
Greenville	91	55	73.5	1.10	
Hackney	95	42	72.0	1.20	
Hanging Rock	99	54	76.6	2.66	
Hillhouse	94	44	69.3	1.06	
Hillsboro	96	52	73.3	3.31	
Hiram	95	53	72.8	1.23	
Hudson	97	4[illegible]	72.0	3.78	
Jacksonboro	99	54	77.2	3.40	
Kenton	98	52	76.1	2.25	
Killbuck	94	49	72.5	0.82	
Lancaster	95	52	73.1	1.24	
Leipsic	97	49	72.8	2.50	
Levering	92	46	69.7	3.97	
Logan	103	49	75.7	1.02	
Lordstown	95	41	69.8	1.26	
Lowell	100[g]	50[g]	78.0[g]	1.44	
McArthur	98	48	74.0	0.89	
McConnelsville	98	51	74.2	1.75	
Mansfield	......	......	......	1.60	
Marietta	92	56	74.6	2.15	
Marion	96	50	74.5	3.47	
Medina	98	44	73.0	1.68	
Milfordton	95	48	72.9	1.45	
Milligan	98	47	73.2	2.40	
Millport	94	43	72.2	1.51	
Montpelier	94	50	71.6	2.81	
Napoleon	94	49	71.0	0.85	
Neapolis	......	......	......	1.01	
New Alexandria	93	53	72.7	1.00	
New Berlin	98	48	73.0	1.49	
New Holland	98	53	75.4	1.50	
New Paris	94	57	75.4	6.26	
New Richmond	100	58	76.9	4.97	
New Waterford	92	45	70.9	2.08	
North Lewisburg	96	52	74.6	0.75	
North Royalton	98	48	73.5	0.72	
Norwalk	97	46	72.3	1.39	
Oberlin	97	45	77.0	1.18	
Ohio State University	94	53	74.2	1.11	
Orangeville	93	41	69.6	2.60	
Ottawa	95	50	73.8	2.85	
Pataskala	96	48	74.0	1.16	
Perry	......	......	......	0.75	
Philo	100	50	75.4	1.39	
Plattsburg	96	55	76.0	0.15	
Pomeroy	96	53	75.6	1.64	
Portsmouth *a*	......	......	......	2.07	
Portsmouth *b*	97	55	76.2	2.07	
Pulse	......	......	......	3.34	
Richwood	98	50	77.8	2.10	
Ridgeville Corners	93	50	73.0	0.93	
Ripley	98	55	75.2	5.92	
Rittman	91	......	......	2.42	
Rockyridge	96	52	73.6	0.82	
Rosewood	92	55	74.4	2.37	
Seaman	100	48	76.4	2.28	
Shenandoah	97	44	72.4	0.53	
Sidney	100	55	77.5	0.52	
Sinking Spring	95	56	73.8	3.05	
Somerset	96	......	......	1.13	
Springboro	......	......	......	5.02	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Ohio—Cont'd.	°	°	°	*Ins.*	*Ins.*
Strongsville	......	......	......	0.61	
Thurman	99	53	76.3	2.00	
Tiffin	93	52	73.0	0.90	
Upper Sandusky	96	50	73.7	2.67	
Urbana	91	54	73.6	0.55	
Vanceburg	99	55	75.6	4.25	
Vermillion	94	51	71.4	1.32	
Vickery	96	50	72.8	1.38	
Walnut	......	......	......	0.89	
Warren	93	44	71.4	1.75	
Warsaw	104	44	74.6	4.08	
Wauseon	97	49	73.6	0.84	
Waverly	100	53	77.2	2.66	
Waynesville	97	56	74.1	4.67	
Wellington	96	47	73.2	0.73	
Westerville	90	54	72.8	2.41	
Willoughby	......	......	......	0.58	
Wooster	95	39	71.0	0.53	
Zanesville	......	......	......	2.45	
Oklahoma.					
Arapaho	109	64	87.4	0.15	
Beaver	106	61	82.8	1.08	
Burnett	109	63	85.0	0.00	
Clifton	104	60	83.0	0.40	
Fort Reno	107	65	85.1	T.	
Fort Sill	104	68	84.8	0.00	
Guthrie	105	69	85.8	1.56	
Hennessey	108[d]	61	81.4	0.60	
Hopeton	109	60	84.8	0.27	
Kingfisher	109	65	87.3	0.73	
Mangum	106	64	83.8	T.	
Newkirk	106	63	84.8	1.28	
Norman	108	65	85.2	0.07	
Pawhuska	103	59	82.2	1.62	
Perry	106	64	83.6	3.18	
Prudence	110	59[e]	86.4[e]	0.48	
Sac and Fox Agency	107	62	84.2	0.50	
Stillwater	105	63	85.4	2.57	
Waukomis	111	61	86.0	1.97	
Winnview	109	60	85.9	0.05	
Woodward	109	69	87.6	0.70	
Oregon.					
Albany *b*	......	......	......	3.20	
Alpha	87	45	61.0	3.32	
Arlington	93	48	66.4	0.59	
Ashland *b*	91	40	62.8	0.61	
Aurora *[1]	85	48	61.3	2.73	
Aurora (near)	85	40	59.4	2.64	
Bandon	66	43	57.3	2.25	
Bay City	75	42	58.6	5.43	
Beulah	95	28	61.6	0.10	
Blalock	95	50	69.0	0.41	
Bullrun	77	44	58.6	6.05	
Burns (near)	90	32	60.9	0.87	
Cascade Locks	84	45	62.2	4.82	
Comstock *[1]	88	45	62.0	2.62	
Coquille River	......	......	......	1.97	
Corvallis	89	41	61.4	2.76	
Dayville	89	37	61.5	1.24	
Ella	......	......	......	0.92	
Eugene	85	44	60.6	3.14	
Fairview	83	41	59.8	2.57	
Falls City	88	41	59.2	2.92	
Gardiner	72	47	60.0	4.22	
Glenora	90	38	58.2	5.89	
Government Camp	77	31	48.6	7.56	
Grants Pass	94	39	64.1	0.96	
Heppner	90	39	61.4	1.87	
Hood River (near)	89	39	60.8	2.01	
Jacksonville	94	41	64.8	0.97	
Joseph	85	33	56.9	1.83	
Junction City *[1]	92	50	65.2	2.47	
Kerby	89	37	62.4	1.15	
Klamath Falls	94	32	61.4	0.08	
Lafayette *[1]	90	46	61.8	2.12	
Lagrande	89	41	63.0	2.48	
Lakeview	87	28	58.8	0.50	
Langlois	80	44	62.0	3.02	
Lonerock	90	31	56.8	2.01	
McMinnville [1]	89*	32	60.4	3.71	
Merlin *[1]	95	41	65.2	1.04	
Monmouth *a* *[1]	89	54	66.3	2.36	
Monmouth *b*	89	40	62.0	2.20	
Monroe	87	46	61.9	2.26	
Nehalem	......	......	......	8.13	
Newberg	91	39	61.7	2.44	
Newbridge	92	32	61.4	1.14	
Newport	67	44	56.8	4.21	
Pendleton	97	42	66.9	2.10	
Placer	......	......	......	1.34	
Prineville	83	30	54.0	0.70	
Riddles *[1]	84	48	62.7	1.22	
Riverside	97	16	58.8	T.	
Salem *b*	88	40	62.0	2.91	
Sheridan *[1]	87	41	61.0	3.27	
Silver Lake	88	26	56.8	0.40	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Oregon—Cont'd.	°	°	°	*Ins.*	*Ins.*
Silverton *[1]	86	54	64.4	3.15	
Siskiyou *[1]	88	40	62.4	0.00	
Sparta	87	33	59.4	2.58	
Springfield *[1]	83	48	61.3	3.07	
Stafford	87	44	61.0	3.52	
The Dalles	92	45	64.7	0.86	
Tillamook Rock	......	......	......	4.27	
Toledo	78	40	55.8	2.80	
Umatilla	......	......	......	1.89	
Vale	94	30	63.3	0.55	
Vernonia	97	40	62.2	2.83	
Westfork *[1]	89	40	60.6	0.69	
Weston	93	40	61.6	3.26	
Williams	89	36	61.0	0.76	
Pennsylvania.					
Altoona	93	45	70.4	4.46	
Aqueduct	......	......	......	8.21	
Athens	98	39	71.2	4.32	
Beaver Dam	......	......	......	5.41	
Bethlehem	......	......	......	4.83	
Brookville	......	......	......	1.68	
Browers Lock	......	......	......	5.28	
Butler	91	44	69.2	3.46	
Carlisle	94	......	......	10.09	
Cassandra	87	45	68.1	3.77	
Cedarrun	......	......	......	2.43	
Centerhall	94	45	71.3	3.79	
Chambersburg	96	......	......	4.51	
Coatesville	97	47	74.1	4.52	
Confluence	......	......	......	2.53	
Coopersburg	91	51	71.6	4.88	
Davis Island Dam	......	......	......	3.83	
Derry Station	98	48	73.0	5.06	
Driftwood	......	......	......	2.10	
Duncannon	......	......	......	4.47	
Dushore	93	......	......	3.79	
East Bloomsburg	......	......	......	5.62	
East Mauch Chunk	98	43	71.8	4.69	
Easton	93	49	72.6	5.87	
Ellwood Junction	......	......	......	5.18	
Emporium	92	43	69.4	3.78	
Everett	94	44	70.9	3.62	
Farrandsville	......	......	......	4.67	
Forks of Neshaminy *[1]	91	58	72.0	2.89	
Franklin	94	46	70.2	1.77	
Frederick	......	......	......	5.23	
Freeport	......	......	......	3.48	
Girardville	......	......	......	7.40	
Grampian	92	46	70.1	3.54	
Greensboro	94	50	73.0	1.88	
Hamburg	96	49	72.7	3.00	
Hawley	94	38	68.7	2.43	
Hawthorn	98	44	71.6	2.47	
Hews Island Dam	......	......	......	2.39	
Huntingdon *a*	101	40	71.4	4.53	
Huntingdon *b*	......	......	......	4.96	
Irwin	......	......	......	1.69	
Johnstown	94	48	72.8	5.34	
Keating	......	......	......	1.49	
Kennett Square	96	50	73.1	4.47	
Lansdale	......	......	......	7.75	
Lawrenceville	96	36	68.7	6.06	
Lebanon	97	46	73.4	3.18	
Leroy	93	48	69.8	6.84	
Lewisburg	98	42	73.1	5.49	
Lock Haven *a*	100	46	73.8	5.36	
Lock Haven *b*	......	......	......	5.05	
Lock No. 4	......	......	......	1.48	
Lycippus	92	51	72.0	3.65	
Mifflin	......	......	......	3.60	
Nisbet	......	......	......	4.08	
Oil City	......	......	......	1.28	
Ottsville	......	......	......	3.51	
Parker	......	......	......	0.86	
Philadelphia	95	57	74.6	5.79	
Point Pleasant	......	......	......	5.91	
Quakertown	96	47	72.0	5.76	
Reading [2]	......	......	71.9	4.62	
Reedsville	95	45	71.4	2.09	
Renovo *a*	......	......	......	1.45	
Renovo *b*	96	44	71.6	1.40	
Ridgway	......	......	......	3.84	
Saegerstown	95	40	69.2	0.54	
St. Marys	......	41	......	4.09	
Salem Corners	95	44	69.4	2.36	
Scranton	98	41	70.4	3.62	
Seisholtzville	......	......	......	3.69	
Selinsgrove *a*	96	44	72.8	4.63	
Shawmont	......	......	......	3.56	
Shinglehouse	98	33	68.0	3.74	
Sinnamahoning	......	......	......	1.79	
Smethport	92	40	67.5	1.70	
Smiths Corners	......	......	......	4.96	
Somerset	93	42	69.2	4.17	
South Eaton	95	41	70.2	3.38	
State College	96	47	71.0	2.76	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Pennsylvania—Cont'd.	°	°	°	*Ins.*	*Ins.*
Sunbury				3.55	
Swarthmore	90	55	73.6	3.00	
Swiftwater	89	44	65.8	4.97	
Towanda	95	39	69.6	5.43	
Trout Run				7.81	
Uniontown	93	53	73.1	3.38	
Warren	89	43	68.4	1.39	
Wellsboro	96	38	69.2	3.49	
West Chester	92	55	73.2	4.38	
West Newton				2.84	
Wilkesbarre	97	45	72.4	2.67	
Williamsport	94	45	72.5	4.15	
York	95	48	73.5	6.76	
Rhode Island.					
Bristol	84	54	69.8	1.74	
Kingston	84	46	68.4	6.00	
Lonsdale				1.83	
Pawtucket	88	52	71.0	1.51	
Providence *a*	91	54	72.1	1.56	
South Carolina.					
Allendale	97	65	81.6	16.59	
Anderson				2.60	
Batesburg	103	64	80.9	5.30	
Beaufort	103	68	83.3	10.51	
Blackville	100	62	81.9	7.91	
Calhoun Falls				6.65	
Camden				6.42	
Cheraw *a*	101	64	82.9	1.23	
Cheraw *b*				1.33	
Clemson College	100	63	79.6	3.00	
Conway				6.95	
Darlington				4.82	
Edisto				3.95	
Effingham				1.85	
Florence	100	66	82.0	3.77	
Gaffney				3.75	
Georgetown	98	69	82.0	7.77	
Greenville	97	63	78.9	2.82	
Greenwood	102	63	82.0	6.16	
Holland	100	61	79.5	3.96	
Kingstree *a*	97	68	82.4	5.28	
Kingstree *b*				5.24	
Little Mountain	101	65	82.5	3.97	
Longshore	102	62	81.5	4.82	
Pinopolis *1	94	70	79.9	17.94	
St. Georges	98	67	81.6	10.34	
St. Matthews	100	67	82.2	6.89	
St. Stephens				10.81	
Santuck	102	59	81.0	2.07	
Shaws Fork	99	60	80.2	6.45	
Smiths Mills				4.13	
Society Hill	97	68	81.6	3.55	
Spartanburg	98	63	79.6	5.21	
Statesburg	102	65	81.5	6.79	
Summerville	98	67	80.4	15.42	
Temperance	102	64	82.0	3.73	
Trenton	97	67	82.1	6.55	
Trial	95	63	77.8	9.98	
Winnsboro	94	64	78.8	4.12	
Yemassee	100	65	82.6	7.55	
Yorkville	101	64	82.2	2.25	
South Dakota.					
Aberdeen	96	47	71.7	9.52	
Alexandria	101	45	73.8	4.92	
Armour	95	45	72.6	5.55	
Ashcroft	96	37	68.4	1.52	
Bowdle	92	44	68.3	5.96	
Brookings	95	44	69.4	3.25	
Canton	95	45	72.0	3.44	
Centerville				7.14	
Chandler	96	45	73.1	2.42	
Clark				5.17	
Desmet	92	48	69.7	4.83	
Doland	98	47	73.0	5.66	
Elkpoint	95			4.76	
Farmingdale				T.	
Flandreau	100	48	72.2	3.49	
Forestburg	102	48	72.2	1.73	
Forest City	99	50	73.8	1.00	
Fort Meade	99	49	70.6	0.30	
Gann Valley	100	51	74.6	2.95	
Goudyville	99	44	71.8	2.28	
Highmore	101	50	74.6	2.19	
Hitchcock				3.74	
Hotch City				1.81	
Hot Springs	95	34	65.5	0.08	
Howard	98	50	71.9	4.09	
Interior	104	46	76.0	2.00	
Kimball	99	52	73.8	1.59	
Leola		41		4.57	
Leslie	101	36	73.8	2.50	
Mellette	93	44[f]	71.4[e]	5.90	
Menno	99	45	73.0	4.22	
Millbank	93	48	68.6	7.00	
Mitchell	97	48	72.2	2.31	
Montrose	98	48	71.4	......	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum	Mean.	Rain and melted snow.	Total depth of snow.
South Dakota—Cont'd.	°	°	°	*Ins.*	*Ins.*
Oelrichs	102	39	71.5	0.80	
Parker	97	45	73.0	8.36	
Plankinton	98[c]	48	73.3[d]	1.39	
Redfield	94	47	71.4	5.98	
Rochford	92	30	61.7	1.11	
St. Lawrence	100	41	73.2	3.85	
Shiloh	96	48	70.0	0.88	
Silver City				0.73	
Sioux Falls	96[n]	44[n]	71.6[n]	5.23	
Spearfish	94	45	68.8	0.50	
Tyndall	97	49	72.9	4.82	
Watertown	91	48	68.7	5.03	
Waubay	92	40	68.0	8.02	
Wentworth	96	49	70.4	4.65	
Wessington Springs	95	41	67.7	1.70	
Whiteswan	98	41	73.4	9.56	
Wolsey				2.03	
Tennessee.					
Andersonville	96	60	77.0	1.56	
Arlington	99	60	80.6	2.61	
Ashwood	97	65	80.7	3.02	
Benton	98	60	79.8	2.50	
Bluff City				3.02	
Bolivar	98	65	81.0	1.11	
Bristol	91	54	73.4	2.18	
Brownsville	100	64	82.2	0.69	
Byrdstown	92	60	76.8	2.52	
Carthage	97	62	79.2	3.00	
Clinton				1.04	
Covington	103	66	84.2	1.57	
Decatur	97	61	78.6	2.23	
Dover		59		2.86	
Dyersburg	99	64	82.4	3.00	
Elizabethton	96	55	76.8	3.03	
Elk Valley				1.05	
Erasmus	94	51	73.2	3.02	
Florence	93	64	78.7	4.05	
Franklin	100	62	80.1	0.83	
Grace *1	98	70	79.0	4.10	
Greeneville	94	57	75.5	3.03	
Harriman	100	62	77.8	1.96	
Hohenwald	95	59	77.4	4.48	
Jackson *	98	65	80.8	1.00	
Johnsonville	99	60	79.6	2.94	
Jonesboro *1	90	61	74.6	2.73	
Kingston				1.46	
Lafayette *5	96	60	77.9	4.60	
Lewisburg	98	64	80.8	2.96	
Liberty	98	60	80.4	2.28	
Lynnville	95	54	79.9	4.09	
McMinnville	98	60	78.2	3.23	
Madison	96	62	79.6	3.32	
Maryville *5	97	61	78.8	2.89	
Milan	101	62	82.4	2.60	
Newport	94	59	77.9	1.80	
Nunnelly	96	60	78.8	4.69	
Oakhill	94	58	76.4	2.91	
Palmetto	100	63	80.9	1.58	
Peryear				3.05	
Pope	100	55	79.8	3.01	
Rogersville	92	59	75.0	1.90	
Rugby	92	55	74.0	0.97	
Savannah	98	65	81.4	3.97	
Sewanee	92	62	76.9	4.53	
Silverlake	86	51	70.0	3.08	
Springdale	98	57	78.6	2.61	
Springfield	97	60	79.0	2.40	
Sylvia	95	62	79.0	......	
Tazewell				1.18	
Tellico Plains	99	59	79.0	3.55	
Tracy City	93	60	75.8	5.68	
Trenton	100	65	82.8	0.79	
Tullahoma	94	60	77.8	3.00	
Union City	96	61	81.0	0.31	
Waynesboro	96	62	79.0	2.43	
Wildersville	94	64	79.4	2.70	
Yukon	96	65	79.8	2.15	
Texas.					
Albany *1	104	66	89.6	0.00	
Anna	109	64[l]	85.8[l]	T.	
Anson				0.00	
Arthur				0.00	
Austin *a*	101	68	85.0	0.40	
Austin *b* *5	100	68	85.0	......	
Ballinger	103	67	84.6	0.00	
Beaumont	104			5.90	
Beeville	105	70	86.0	0.15	
Blanco	105	66	85.6	0.00	
Boerne *1	101	71	85.2	0.39	
Brazoria	96	70	82.8	5.62	
Brenham	100	70	85.5	0.56	
Brighton	94	73	84.4	0.00	
Brownwood				0.05	
Burnet *1	102	69	84.6	0.49	
Camp Eagle Pass		64		0.00	
Childress	106	66	85.3	T.	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Texas—Cont'd	°	°	°	*Ins.*	*Ins.*
Coleman	104	62	84.9	0.10	
Colorado				0.00	
Columbia	95	68	82.6	3.25	
Conroe	98	67	84.0	5.87	
Corsicana	104	59	88.8	0.63	
Cuero	100	70	85.9	0.23	
Dallas	106	68	87.2	T.	
Danevang	104	69	86.0	1.81	
Dublin	103	67	85.0	0.10	
Duval	100	69	85.4	0.12	
Emory	108	66	88.0	0.69	
Estelle	108	67	87.6	0.00	
Forestburg				0.00	
Fort Brown	101	73	86.2	0.00	
Fort Clark	101	70	86.2	0.00	
Fort McIntosh	106	74	89.4	0.00	
Fort Ringgold	107	71	87.6	0.00	
Fort Stockton				0.00	
Fredericksburg *1	102	68[c]	85.2[c]	0.29	
Fruitland	108	66	88.1	0.00	
Georgetown *1	105	71	85.8	0.46	
Grapevine	107	67	88.0	T.	
Hale Center	100	52	80.9	0.00	
Hallettsville	100	68	85.4	T.	
Hearne	102	72	87.0	0.35	
Henrietta	109	68	88.6	0.00	
Hewitt				1.35	
Hondo				0.00	
Honeygrove				T.	
Houston	96	68	84.0	4.91	
Hulen	100	66	83.6	5.30	
Huntsville	98	68	85.2	0.33	
Jacksonville	103	66	84.8	2.52	
Jasper	100	69	84.1	......	
Kent				0.30	
Kerrville	103	62	82.5	0.34	
Lampasas	103	67	85.1	0.62	
Langtry	103			0.00	
La Parra				0.00	
Laureles Ranch				0.00	
Llano *5	104	75	85.8	T.	
Luling	102	70	85.8	0.13	
Mann	112	68	86.4	0.83	
Marathon	102	56	78.2	0.00	
Monahans				T.	
Mount Blanco	104	62	82.2	0.00	
New Braunfels	100	68	84.8	0.00	
Panter				T.	
Paris *a*	110	68	88.6	0.02	
Point Isabel *1	94	80	84.5	0.00	
Rhineland	110	66	89.0	0.00	
Rockisland	101	69	84.4	0.73	
Rockport *1	89	73	80.2	......	
Rocksprings				0.00	
Runge	104	72	87.8	0.45	
Sabine Pass	98	70	84.6	5.88	
San Antonio	104	72	89.3	0.00	
Sanderson		78		0.00	
San Marcos	100	67	82.9	0.00	
Sherman	103	72	88.2	0.00	
Sugarland	108	70	87.4	1.11	
Sulphur Springs	106	68	86.8	0.52	
Temple *a*	100	67	85.6	0.15	
Temple *b*	102	66	85.0	0.17	
Tyler	103	68	86.4	0.86	
Valentine	99			2.06	
Victoria				0.35	
Waco	103	70	87.6	1.40	
Waxahachie	107	62	87.3	0.35	
Weatherford	104	66	87.6	0.00	
Utah.					
Bluecreek *1	94	44	68.7	0.74	
Brigham				1.61	
Castledale	87	40	65.8	1.24	
Corinne	94	31	68.0	1.10	
Croydon	88	24	59.4	1.20	
Fillmore	97	32	67.9	0.28	
Fort Duchesne	91	34	66.6	0.90	
Frisco	91	44	68.6	0.18	
Giles	99	39	69.0	0.78	
Grover	91	35	61.6	1.51	
Heber	86	28	60.8	2.10	
Huntsville				0.55	
Kelton *1	95	45	67.7	T.	
Levan	92	35	64.4	1.06	
Loa	88	30	60.4	0.77	
Logan	88[d]	35	66.4	0.70	
Manti	96	37	66.6	1.13	
Marysvale				1.50	
Millville				1.16	
Minersville	94	38	68.0	0.63	
Moab	99	42	74.0	2.04	
Mount Pleasant	98	34	68.6	1.24	
Ogden *a* *1	96	42	69.4	0.45	
Pahreah	95	43	69.9	0.20	
Parowan	93	39	66.8	0.82	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Temperature. (Fahrenheit.) Minimum.	Temperature. (Fahrenheit.) Mean.	Precipitation. Rain and melted snow.	Precipitation. Total depth of snow.
Utah—Cont'd.	°	°	°	*Ins.*	*Ins.*
Pinto	86	33	57.8	1.06	
Promontory *[1]	98	36	65.0	1.06	
Richfield	92	34	59.7	0.12	
St. George	102	44	72.8	2.93	
Scipio	89	29	66.2	1.03	
Snowville	89	27	63.1	0.50	
Soldier Summit	......	25	......	0.45	
Terrace *[1]	97	30	61.4	0.00	
Tooele	92	43	69.4	0.98	
Tropic	86	31	58.8	0.55	
Vernal	88	48	66.6	1.63	
Woodruff	86	26	57.3	0.34	
Vermont.					
Bennington	93	40	68.6	1.26	
Brattleboro	91	41	68.8	1.78	
Burlington	93	51	72.6	3.82	
Chelsea	88	39	64.5	0.46	
Cornwall	96	42	69.9	0.38	
Derby	89	39	66.0	2.37	
Enosburg Falls	94	37	66.4	1.99	
Hartland	89	36	64.6	1.66	
Jacksonville	89	34	62.9	2.06	
Norwich	93	37	65.6	......	
St. Johnsbury	86	38	64.6	3.24	
Vernon *[6]	89	48	71.1	1.96	
Wells	92	42	68.2	0.71	
Woodstock	90	36	64.3	2 70	
Virginia.					
Alexandria	97	59	77.0	4.49	
Ashland	98	53	76.8	5.11	
Barboursville	95	59	75.6	3.14	
Bedford	98	57	77.5	6.86	
Bigstone Gap	95	54	74.4	[a]3.13	
Birdsnest *[1]	93	67	77.2	3.30	
Blacksburg	91	50	71.8	3.80	
Buckingham	......	59	......	7.46	
Burkes Garden	87	42	67.8	1.39	
Callaville	95	62	76.9	0.98	
Christiansburg	......	......	......	2.92	
Clarksville	......	......	......	2.69	
Clifton Forge	94	55	75.8	2.12	
Columbia	......	......	......	4.60	
Dale Enterprise	98	49	72.8	2.18	
Danville	......	......	......	3.24	
Dwale	......	......	......	2.21	
Farmville	102	61	78.5	8.02	
Fontella	100	59	77.4	8.81	
Fredericksburg	94	59	76.3	4.45	
Hampton	94	69	79.4	3.45	
Hot Springs	91	47	71.8	2.05	
Lexington	94	58	75.7	5.41	
Manassas	95	55	75.6	4.89	
Marion	95	49	73.2	2.63	
Miller School	......	55	......	6.01	
Newport News[d]	100	70	82.9	2.46	
Petersburg	97	62	77.8	5.81	
Quantico	93	52	74.4	......	
Radford	......	......	......	2.78	
Richmond (near)	97	61	76.0	5.34	
Rockymount	95	60	76.8	1.63	
Salem	95	61	77.8	4.44	
Speers Ferry	......	......	......	1.69	
Spottsville	96	61	78.0	4.41	
Stanardsville	95	55	74.6	4.14	
Staunton	99	53	75.6	5.46	
Stephens City	98	50	74.8	3.50	
Sunbeam	96	63	78.2	6.02	
Warrenton	96	61	76.4	6.04	
Warsaw	95	60	77.2	3.22	
Westbrook Farm	98	62	77.1	......	
Westpoint	......	......	......	2.80	
Woodstock	96	49	74.2	3.17	
Wytheville	93	52	73.8	2.37	
Washington.					
Aberdeen	77	43	59.8	3.16	
Anacortes	......	......	......	2.24	
Ashford	......	......	......	5.78	
Bremerton	81	44	60.6	2.12	
Brinnon	78	45	60.0	2.57	
Cedonia	83	34	54.8	2.67	
Centerville	96	32	59.6	0.83	
Chehalis	82	40	61.4	1.71	
Cheney	......	......	......	0.24	
Clearwater	74	43	59.0	3.56	
Cle Elum	88	30	56.4	1.13	
Colfax	86	......	......	2.38	
Connell	......	......	......	0.23	
Coupeville	82	40	59.2	2.84	
Crescent	95	......	......	1.58	
Dayton	91	42	61.7	2.07	
Ellensburg	85	36	60.2	0.99	
Ellensburg (near)	90	40	62.2	1.55	
Fort Simcoe	95	40	64.8	0.62	
Grandmound	85	41	60.5	1.96	
Hooper	95	44	65.2	1.98	
Kennewick	96	45	68.8	1.42	
Washington—Cont'd.	°	°	°	*Ins.*	*Ins.*
Lacenter	86	43	60.4	4.00	
Lakeside	89	44	65.4	1.43	
Lind	100	45	70.5	0.66	
Mayfield	87	40	60.8	3.00	
Moxee Valley	94	38	63.8	1.12	
New Whatcom	77	39	58.0	3.04	
Northbend	84	35	60.2	4.94	
Northport	90	34	59.2	2.24	
Olga	75	40	55.1	2.31	
Olympia	82	40	60.0	1.37	
Orcas Island	75	40	58.6	1.82	
Pinehill	88	41	62.4	1.24	
Pomeroy	93	42	67.4	2.32	
Port Townsend	76	44	58.0	2.52	
Pullman	93	38	60.8	2.20	
Ritzville	......	......	......	0.72	
Rosalia	87	38	58.3	1.70	
Silvana	79	38	57.8	5.71	
Snohomish	90	43	59.8	5.77	
Snoqualmie	82	46	64.8	4.66	
Southbend	83	40	59.2	3.19	
Sunnyside	93	41	65.2	0.60	
Union	81	41	60.4	2.56	
Usk	90	32	60.1	......	
Vancouver	85	42	61.0	3.03	
Vashon	77	43	59.1	2.68	
Waterville	91	36	60.9	1.14	
Wenatchee (near)	90	38	62.5	0.76	
West Virginia.					
Beckley [e]	86	47	68.8	0.84	
Beverly	94	49	71.6	3.07	
Bluefield	91	52	71.6	3.25	
Buckhannon *a*	......	......	......	2.78	
Burlington	97	44	73.2	1.06	
Cairo	95	46	70.4	5.47	
Charleston	......	......	......	4.57	
Dayton	94	49	72.8	2.39	
Eastbank	94	60	76.8	2.06	
Elkhorn	92	53	73.4	1.30	
Fairmont	......	......	......	3.01	
Glenville	92	54	73.0	1.74	
Grafton	94	49	72.2	2.10	
Green Sulphur	93	53	75.0	1.57	
Hamlin	95	53	78.0	2.35	
Harpers Ferry	......	......	......	5.69	
Hinton *a*	......	......	......	2.45	
Hinton *b*	96	59	76.6	......	
Huntington	97	55	76.4	3.22	
Kingwood	93	50	71.3	2.55	
Madison	93[b]	56[b]	76.2[b]	6.37	
Marlinton	90	48	70.0	3.43	
Martinsburg	95	50	73.2	3.01	
Morgantown	97	50	74.5	1.78	
New Cumberland	100	49	75.2	2.85	
New Martinsville	98	52	75.2	1.40	
Nuttallburg	90	50	72.6	2.13	
Oceana	94	54	75.4	2.46	
Oldfields	95	46	72.8	3.17	
Parsons	90	50	71.2	2.37	
Philippi *a*	95	50	73.2	1.90	
Philippi *b*	......	......	......	1.75	
Point Pleasant	98	55	76.6	2.17	
Powellton	90	51	73.0	2.50	
Romney	95	48	73.9	0.34	
Rowlesburg	......	......	......	2.96	
Terra Alta	......	......	......	1.72	
Uppertract	98	44	73.0	3.76	
Weston *a*	......	......	......	3.28	
Weston *b*	95	53	75.2	......	
Wheeling *a*	......	......	......	1.21	
Wheeling *b*	97	58	77.7	1.20	
Wisconsin.					
Amherst	94	40	70.4	1.09	
Antigo	94	41	67.2	1.69	
Barron	92	38	67.4	5.87	
Bayfield	88	50	69.8	4.42	
Beloit	93	51	72.7	2.49	
Brodhead	98	46	73.2	2.59	
Butternut	92	37	67.2	4.71	
Chilton	94	44	70.8	2.22	
Citypoint	93	51	71.8	2.61	
Delavan	97	49	73.8	2.52	
Dodgeville	94	46	71.4	2.77	
Easton	94	40	70.9	4.93	
Eau Claire	93	50	71.6	7.67	
Florence	88	40	65.8	2.82	
Grand River Locks	......	......	......	4.02	
Grantsburg	94	44	68.1	4.89	
Hartford	96	48	72.2	3.43	
Hartland	94	50	72.2	2.06	
Harvey	94	48	71.4	2.99	
Hayward	89	45	67.4	4.46	
Heafford Junction	88	......	......	4.77	
Hillsboro	94	41	69.2	6.59	
Knapp'	92	44	68.8	4.91	
Koepenick *[1]	86	56	66.2	3.40	
Wisconsin—Cont'd.	°	°	°	*Ins.*	*Ins.*
Lancaster	93	48	71.6	4.18	
Lincoln	94	48	71.0	1.00	
Madison	89	53	72.1	3.57	
Manitowoc	88	48	67.4	0.93	
Meadow Valley	95	42	69.6	3.76	
Medford	......	......	......	3.80	
Menasha	......	......	......	2.14	
Neillsville	92	44	69.2	2.76	
New Holstein	......	......	......	1.55	
New London	95	43	69.8	1.88	
Oconto	93	44	69.8	......	
Osceola	96	44	69.0	4.87	
Oshkosh	......	......	......	1.50	
Pepin	94	49	72.3	3.51	
Portage	94	47	71.2	2.58	
Port Washington	92	47	69.3	1.20	
Prairie du Chien	97	47	74.7	3.00	
Prentice *[1]	90	45	65.1	7.40	
Racine	92	54	72.7	1.08	
Sharon	95[d]	51[d]	75.3[d]	1.93	
Shawano	93	41	69.1	1.95	
Spooner	93	40	69.0	4.22	
Stevens Point	94	42	69.8	2.49	
Sturgeon Bay Canal *[10]	88	48	67.1	......	
Two Rivers *[10]	87	56	70.1	......	
Valley Junction	94	37	69.1	3.89	
Viroqua	93	45	70.8	4.53	
Watertown	93	46	70.7	3.85	
Waukesha	92	51	71.5	2.50	
Waupaca	95	43	69.8	2.57	
Wausau	90	44	68.8	2.58	
Westbend [e]	94	49	71.6	2.11	
Westfield	93	46	71.2	3.98	
Whitehall	94	44	71.0	4.91	
Wyoming.					
Alcova	84	27	63.8	0.10	
Basin	97[c]	37[c]	70.8[c]	0.27	
Bedford	82	27	56.4	......	
Bigpiney	78	22	53.0	0.90	
Buffalo	92	36	66.6	T.	
Burns	87	20	54.0	0.53	
Carbon	99	34	68.1	0.49	
Centennial	77	32	55.2	0.94	
Embar	94	33	66.1	......	
Evanston	82	27	57.6	0.73	
Fort Laramie	100	39	71.1	1.38	
Fort Washakie	88	32	63.9	1.75	
Fort Yellowstone	83	34	57.0	2.22	
Fourbear	81	32	56.5	0.32	
Hecla	89	37	63.8	2.04	
Hyattville	94	36	65.4	......	
Laramie	83	32	60.7	1.44	
Lovell	101	33	65.4	0.35	
Lusk	93	46	68.7	1.01	
Rawlins	84	34	61.4	0.43	
Rocksprings	88	23	58.4	0.80	
Sheridan	96	33	67.9	0.12	
Thayne	80	25	55.6	1.38	
Thermopolis	95	34	68.6	......	
Wamsutter	92	38	63.7	1.25	
Wheatland	95	46	69.2	0.49	
Mexico.					
Ciudad P. Diaz	100	80	89.0	T.	
Coatzacoalcos [2]	......	......	81.7	......	
Leon de Aldamas	84	50	68.8	2.96	
Puebla	76	55	65.8	5.85	
Tampico [2]	......	......	83.6	......	
Vera Cruz [2]	......	......	81.6	......	
New Brunswick.					
St. John	76	48	62.0	2.06	
Porto Rico.					
Adjuntas	94	52	74.0	32.22	
Arecibo [j]	87	72	81.4	......	
Bayamon	94	67	80.2	18.02	
Canovanas	85	72	78.5	12.58	
Cayey	92[e]	63[e]	77.4[e]	15.39	
Corozal	92	65	78.8	......	
Fajardo	91	72	82.0	6.21	
Guayama	......	......	......	8.81	
Isabela	90	66	80.2	15.00	
Juana Diaz	96	68	80.8	15.71	
La Isolina	91[c]	66[c]	77.6[c]	22.16	
Lajas	95	65	80.8	22.07	
Luquillo	90	73	80.8	13.65	
Manati	94	67	80.4	11.99	
Mayaguez	90	67	78.2	19.02	
Puerta de Tierra	90	73	81.1	9.22	
San Lorenzo	92	65	79.2	......	
Vieques	90	59	78.4	7.03	

Late reports for July, 1899.

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Alaska.					
Coal Harbor	79	40	55.0	6.51	
Skagway	92	41	62.9	0.59	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
California.	°	°	°	*Ins.*	*Ins.*
Agnew	90	46	66.0	0.00	
Chino	.....	.....	.....	0.00	
Kernville	.....	.....	.....	0.00	
Redding	106	59	81.0	0.00	
Sierra Madre	95	51	72.6	0.00	
Yuba City* [5]	103	58	79.2	0.00	
Delaware.					
Wyoming	92	54	75.3	7.40	
Louisiana.					
Elm Hall	94	69	82.2	3.33	
Maryland.					
Sudlersville	93	53	75.1	.....	
South Dakota.					
Watertown	97	38	67.8	0.95	
Texas.					
Albany* [1]	102	64	81.8	0.72	
Laparra	.....	.....	.....	0.00	
Rocksprings	.....	.....	.....	3.66	
Tulia	97	59	75.5	10.84	
Wyoming.					
Lovell	106	42	72.5	0.81	

EXPLANATION OF SIGNS.

* Extremes of temperature from observed readings of dry thermometer.

A numeral following the name of a station indicates the hours of observation from which the mean temperature was obtained, thus:

[1] Mean of 7 a. m. + 2 p. m. + 9 p. m. + 9 p. m. ÷ 4.
[2] Mean of 8 a. m. + 8 p. m. ÷ 2.
[3] Mean of 7 a. m. + 7 p. m. ÷ 2.
[4] Mean of 6 a. m. + 6 p. m. ÷ 2.
[5] Mean of 7 a. m. + 2 p. m. ÷ 2.
[6] Mean of readings at various hours reduced to true daily mean by special tables.
[7] Mean from hourly readings of thermograph.
[9] Mean of sunrise and noon.
[10] Mean of sunrise, noon, sunset, and midnight.

The absence of a numeral indicates that the mean temperature has been obtained from daily readings of the maximum and minimum thermometers.

An italic letter following the name of a station, as "Livingston *a*," "Livingston *b*," indicates that two or more observers, as the case may be, are reporting from the same station. A small roman letter following the name of a station, or in figure columns, indicates the number of days missing from the record; for instance, "n" denotes 14 days missing.

Table III.—*Mean temperature for each hour of seventy-fifth meridian time, August, 1899.*

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midn't.	Mean.
Bismarck, N. Dak	62.4	61.5	60.0	58.8	58.3	57.6	56.2	57.4	59.3	63.1	66.5	70.0	72.4	74.2	76.2	77.3	78.1	77.8	76.8	75.1	72.0	68.5	66.2	64.0	67.1
Boston, Mass	64.5	63.9	63.4	62.9	62.5	62.9	64.3	66.8	69.2	70.4	70.9	71.4	72.4	72.5	72.6	72.7	72.5	72.1	70.2	68.9	68.0	67.3	66.4	65.4	68.1
Buffalo, N. Y	67.5	66.8	66.2	65.7	65.3	65.4	67.0	68.6	70.5	72.7	74.5	76.0	77.2	77.8	78.4	78.5	78.1	76.6	74.8	73.2	71.8	70.5	69.8	68.8	71.7
Cedar City, Utah	64.6	64.0	63.2	63.0	62.0	61.3	60.7	60.4	60.7	64.9	67.5	69.9	71.5	73.5	74.9	75.9	76.5	76.2	75.8	74.7	72.3	68.7	66.9	65.7	68.1
Chicago, Ill	72.2	71.3	70.8	70.4	70.0	69.6	69.5	70.9	72.0	73.1	73.9	73.9	74.1	74.6	75.5	76.1	76.1	76.1	75.5	74.3	73.5	73.3	72.9	72.6	73.0
Cincinnati, Ohio	73.3	72.0	71.1	70.3	69.2	68.6	68.2	70.4	72.1	75.3	78.2	80.8	82.6	83.9	85.1	86.3	86.7	86.3	84.9	82.5	80.6	78.8	76.6	75.0	77.4
Cleveland, Ohio	69.1	68.3	67.5	66.8	65.9	65.5	66.3	67.9	70.9	72.9	74.4	74.9	75.2	74.3	74.9	75.5	75.9	76.0	76.1	75.1	73.5	72.2	71.3	70.2	71.7
Detroit, Mich	67.9	67.1	66.3	65.6	64.5	64.0	64.4	67.5	70.1	72.5	74.7	76.3	77.8	78.7	79.9	80.2	79.9	79.4	77.7	75.2	72.9	71.2	69.6	68.5	72.2
Dodge, Kans	74.5	73.1	71.7	70.8	69.7	69.1	68.0	68.8	73.1	77.1	81.0	84.6	87.3	89.8	91.4	92.8	92.6	92.4	90.6	86.8	82.1	79.5	77.3	75.6	80.0
Eastport, Me	57.0	56.7	56.3	55.7	55.2	55.6	56.7	58.4	60.6	62.3	63.9	64.8	64.8	65.3	65.6	65.3	64.8	63.6	61.5	60.3	59.4	58.4	57.8	57.4	60.3
Galveston, Tex	81.7	81.6	81.2	81.1	83.7	79.8	79.9	80.5	82.0	83.2	84.7	86.3	86.5	86.7	86.5	86.3	85.5	84.7	84.0	82.9	82.3	82.1	81.8	81.7	83.1
Havre, Mont	58.3	57.1	55.7	54.7	53.5	52.3	51.1	50.9	53.0	56.7	60.4	63.3	66.2	68.5	70.5	71.5	72.5	72.9	71.9	70.8	69.2	66.3	63.2	60.4	62.1
Independence, Cal	73.3	71.1	69.5	67.9	66.4	65.0	63.5	62.6	61.9	64.3	69.1	72.9	76.2	79.3	81.9	83.3	84.2	84.6	84.8	84.5	81.9	79.6	77.5	76.0	74.2
Kalispell, Mont	52.8	51.4	50.0	49.3	48.2	47.2	46.4	46.2	47.4	50.7	53.9	56.9	59.5	61.5	63.3	64.1	65.0	65.4	65.2	64.4	62.6	59.9	56.2	54.4	55.9
Kansas City, Mo	75.7	75.1	74.2	73.6	72.8	72.1	71.5	72.4	75.3	78.5	80.3	83.2	84.0	85.8	87.0	87.9	88.1	87.8	86.6	84.4	81.1	79.1	77.8	76.2	79.6
Key West, Fla	82.5	82.2	82.2	81.7	81.4	81.3	82.2	84.2	85.1	85.7	86.6	86.3	87.1	86.6	87.0	86.6	86.2	84.9	84.2	83.5	83.4	82.9	83.0	82.9	84.2
Marquette, Mich	62.6	62.4	62.2	62.1	61.3	61.1	61.9	64.0	65.8	67.3	68.7	70.1	70.7	70.5	70.3	69.4	69.6	68.8	67.4	66.3	64.3	63.4	62.9	62.5	65.6
Memphis, Tenn	79.4	78.6	78.0	77.4	76.8	76.0	75.4	76.4	78.3	80.2	82.8	84.9	86.5	87.5	88.5	89.1	88.8	87.5	86.1	84.3	83.2	82.3	81.3	80.3	82.1
Mt. Tamalpais, Cal	60.6	60.2	60.5	59.7	59.7	59.7	59.2	58.7	57.7	58.4	59.0	59.9	60.9	62.1	62.9	63.4	65.2	65.3	65.4	63.7	62.9	61.7	61.2	60.5	61.2
New Orleans, La	78.6	78.4	78.2	77.8	77.6	77.5	77.4	78.9	81.3	82.8	84.4	85.5	86.7	87.1	88.5	88.0	87.4	86.2	84.2	82.6	80.3	80.4	79.5	79.0	82.1
New York, N. Y	69.3	69.1	68.6	68.1	67.6	67.7	68.3	69.7	71.5	72.9	75.4	76.5	78.0	78.2	78.2	77.5	76.1	74.9	73.4	73.2	72.0	71.3	70.8	70.3	72.4
Philadelphia, Pa	70.1	69.3	68.7	68.1	67.7	68.0	69.2	71.2	73.0	75.0	76.9	78.9	80.1	81.0	81.5	81.5	80.8	79.1	77.2	75.6	73.2	72.2	71.5	70.9	74.2
Pittsburg, Pa	68.5	67.4	66.3	65.6	64.5	64.6	65.3	67.6	71.1	74.8	77.5	79.6	81.7	81.7	82.3	82.5	82.8	82.0	79.9	77.3	74.6	72.9	71.5	70.2	73.8
Portland, Oreg	61.6	60.4	59.5	58.4	57.3	56.3	55.6	55.2	54.6	55.2	56.7	58.0	59.5	61.4	62.8	64.4	65.8	67.1	67.5	67.4	66.9	65.7	64.1	62.5	61.0
St. Louis, Mo	77.4	76.4	75.7	74.8	73.8	73.3	73.0	74.6	76.9	79.6	82.0	84.2	85.6	86.5	87.4	88.5	88.5	88.0	86.6	84.8	83.1	81.3	79.7	78.5	80.8
St. Paul, Minn	69.3	68.0	66.8	65.8	65.3	64.4	63.8	64.7	66.5	69.2	71.7	74.1	75.7	77.4	78.8	79.5	80.0	80.0	79.2	77.1	75.4	73.5	71.9	70.4	72.0
Salt Lake City, Utah	66.6	65.4	63.7	62.8	62.4	60.8	60.6	61.5	61.1	64.0	68.2	72.2	74.5	76.6	77.5	78.6	79.2	79.3	78.3	77.1	75.6	72.3	69.3	67.6	69.8
San Diego, Cal	64.4	64.1	63.5	63.1	63.0	62.7	62.5	62.1	61.9	62.6	64.0	65.9	67.4	68.3	69.0	69.4	69.5	69.4	68.8	68.4	67.5	66.4	65.5	65.1	65.6
San Francisco, Cal	55.9	55.6	55.1	54.6	54.4	54.2	54.3	54.7	53.8	54.2	55.4	57.1	59.3	60.5	61.3	61.5	61.6	61.3	60.7	60.0	58.9	57.8	56.8	56.2	57.3
Santa Fe, N. Mex	64.7	63.8	62.6	62.1	60.5	59.7	58.2	59.0	63.0	67.3	69.8	72.2	74.2	75.6	76.9	77.8	78.8	77.9	77.3	75.2	72.8	69.6	66.9	65.5	68.8
Savannah, Ga	77.5	77.2	76.7	76.2	75.9	75.5	76.6	79.0	82.6	85.1	87.1	88.6	89.7	89.7	88.6	87.8	86.5	85.3	82.6	80.7	79.4	78.8	78.4	77.6	81.8
Washington, D. C	69.5	68.8	68.1	67.8	67.6	67.3	68.5	71.6	73.5	75.9	77.9	79.3	80.4	81.6	82.5	81.7	80.8	79.9	77.8	75.3	73.9	72.7	71.4	70.4	74.4
West Indies.																									
Basseterre, St. Kitts	78.7	78.4	78.4	78.7	78.5	79.7	81.2	81.9	83.1	83.8	84.4	84.6	84.6	84.0	83.0	82.3	81.0	80.0	80.0	80.2	79.8	79.5	79.0	78.8	81.0
Bridgetown, Bar	77.5	77.3	77.1	77.2	77.2	79.4	81.9	83.5	84.4	85.0	85.5	85.6	85.1	84.5	83.6	82.5	80.9	80.0	79.5	79.3	78.8	78.6	78.1	77.8	80.8
Cienfuegos, Cuba	75.7	74.8	74.4	74.1	73.8	74.0	77.5	81.2	84.1	85.9	87.7	88.7	89.7	89.2	87.7	86.0	84.4	83.0	81.3	80.1	78.7	78.1	77.0	76.5	81.0
Havana, Cuba	78.6	77.9	77.2	76.7	76.1	75.7	77.6	80.5	84.5	86.0	86.8	86.3	86.5	86.2	86.0	84.9	84.3	83.7	82.8	82.2	81.6	81.2	80.3	79.7	81.8
Kingston, Jamaica	74.7	74.3	74.0	73.7	73.5	73.3	75.9	80.6	83.9	86.0	87.9	87.8	87.5	86.7	85.5	85.4	84.5	83.2	81.0	79.6	77.9	77.2	75.9	75.4	80.2
Port of Spain, Trin	75.3	74.7	74.3	74.1	74.1	74.8	77.9	81.4	82.7	84.3	84.5	85.2	84.8	84.6	84.5	83.3	82.3	80.3	79.4	78.7	77.7	77.3	76.7	75.9	79.5
P. Principe, Cuba	73.7	73.0	72.5	72.1	71.9	71.9	75.0	78.7	81.7	84.8	87.0	90.0	91.4	92.2	90.6	87.6	84.8	82.0	79.8	78.2	76.9	76.0	75.2	74.4	80.1
San Juan, P. R	77.4	77.0	76.8	76.4	76.1	76.5	78.5	81.5	82.4	82.7	83.9	84.0	84.2	83.6	82.6	82.5	81.6	80.3	79.7	79.6	78.7	78.5	78.2	77.7	80.0
Santiago de Cuba	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Santo Domingo, S. D	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Willemstad, Curaçao	79.7	79.5	79.4	79.3	79.2	79.0	80.7	81.9	83.0	83.9	84.3	85.2	85.8	86.0	85.5	84.8	83.1	81.8	81.0	80.7	80.7	80.5	80.3	80.0	81.9

Table IV.—*Mean pressure for each hour of seventy-fifth meridian time, August, 1899.*

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midn't.	Mean.
Bismarck, N. Dak	28.132	.135	.134	.138	.139	.143	.150	.161	.164	.172	.169	.167	.157	.149	.138	.129	.117	.111	.106	.105	.113	.124	.133	.138	.139
Boston, Mass	29.867	.864	.864	.867	.874	.884	.891	.894	.896	.893	.887	.880	.871	.863	.855	.848	.849	.853	.858	.867	.874	.876	.874	.874	.872
Buffalo, N. Y	29.174	.172	.173	.174	.182	.192	.200	.204	.205	.207	.202	.194	.183	.174	.162	.155	.153	.152	.154	.156	.166	.167	.170	.175	.177
Cedar City, Utah	24.271	.275	.278	.276	.273	.273	.275	.279	.291	.300	.306	.312	.307	.300	.289	.278	.268	.257	.247	.240	.236	.243	.255	.268	.275
Chicago, Ill	29.113	.108	.110	.109	.112	.122	.133	.139	.145	.146	.144	.143	.138	.129	.117	.107	.098	.091	.088	.090	.100	.106	.112	.114	.117
Cincinnati, Ohio	29.316	.316	.313	.315	.319	.340	.340	.346	.351	.353	.352	.342	.333	.317	.300	.289	.283	.279	.279	.287	.300	.309	.313	.317	.317
Cleveland, Ohio	29.175	.173	.174	.177	.185	.196	.203	.208	.211	.211	.208	.198	.187	.175	.168	.162	.157	.155	.157	.160	.169	.172	.175	.176	.181
Detroit, Mich	29.207	.203	.201	.204	.208	.215	.226	.236	.241	.242	.243	.236	.228	.217	.200	.191	.186	.185	.185	.188	.199	.208	.208	.208	.211
Dodge, Kans	27.325	.328	.326	.328	.330	.331	.335	.338	.346	.352	.351	.341	.334	.318	.303	.286	.273	.266	.260	.272	.284	.298	.313	.321	.315
Eastport, Me	29.909	.909	.910	.912	.919	.926	.931	.937	.935	.935	.929	.924	.916	.910	.906	.903	.900	.903	.908	.916	.918	.920	.921	.921	.917
Galveston, Tex	29.865	.862	.858	.85[illegible]	.860	.865	.878	.892	.904	.909	.912	.910	.899	.888	.875	.857	.846	.840	.838	.844	.852	.866	.871	.868	.887
Havre, Mont	27.273	.268	.267	.263	.265	.263	.264	.271	.272	.274	.272	.268	.256	.248	.237	.228	.219	.216	.219	.217	.225	.241	.255	.260	.252
Independence, Cal	25.878	.886	.894	.895	.898	.905	.909	.917	.928	.934	.936	.939	.935	.923	.906	.889	.873	.856	.842	.836	.829	.834	.850	.868	.890
Kalispell, Mont	26.858	.856	.854	.854	.855	.857	.860	.863	.872	.877	.877	.875	.873	.864	.857	.848	.842	.833	.829	.828	.829	.835	.847	.850	.854
Kansas City, Mo	28.920	.914	.912	.915	.923	.928	.941	.946	.955	.959	.961	.959	.949	.940	.929	.917	.902	.894	.892	.896	.905	.919	.922	.925	.926
Key West, Fla	29.947	.940	.935	.932	.934	.941	.954	.957	.968	.974	.975	.970	.961	.945	.931	.919	.915	.915	.921	.932	.942	.948	.952	.950	.944
Marquette, Mich	29.159	.157	.158	.163	.169	.175	.179	.180	.183	.185	.185	.184	.179	.173	.160	.155	.149	.149	.149	.152	.161	.163	.164	.167	.167
Memphis, Tenn	29.518	.512	.509	.510	.514	.524	.536	.547	.553	.559	.562	.561	.554	.538	.522	.506	.496	.493	.495	.497	.504	.514	.520	.523	.524
Mt. Tamalpais, Cal	27.496	.494	.492	.485	.485	.480	.480	.483	.495	.505	.519	.527	.534	.537	.534	.529	.522	.510	.502	.497	.485	.485	.493	.499	.503
New Orleans, La	29.885	.880	.880	.880	.885	.891	.905	.915	.925	.926	.928	.924	.914	.899	.880	.866	.856	.857	.859	.868	.876	.885	.890	.892	.890
New York, N. Y	29.663	.661	.659	.660	.668	.676	.684	.689	.691	.692	.686	.677	.669	.660	.652	.648	.645	.646	.652	.660	.668	.670	.672	.673	.668
Philadelphia, Pa	29.865	.863	.861	.861	.869	.877	.885	.888	.893	.895	.889	.882	.873	.866	.855	.850	.848	.846	.852	.859	.873	.877	.875	.874	.870
Pittsburg, Pa	29.097	.094	.093	.095	.101	.112	.123	.125	.126	.126	.118	.108	.097	.084	.073	.066	.060	.062	.069	.078	.090	.096	.100	.104	.096
Portland, Oreg	29.830	.833	.837	.840	.839	.837	.836	.835	.840	.848	.852	.855	.856	.853	.848	.840	.833	.822	.814	.808	.808	.805	.811	.824	.833
St. Louis, Mo	29.336	.331	.330	.333	.340	.348	.363	.367	.374	.380	.384	.376	.368	.357	.340	.325	.315	.307	.302	.308	.319	.331	.339	.342	.342
St. Paul, Minn	29.039	.033	.035	.034	.039	.045	.053	.055	.060	.058	.055	.056	.047	.037	.025	.016	.015	.008	.006	.007	.015	.025	.041	.040	.035
Salt Lake City, Utah	25.563	.567	.568	.566	.568	.572	.574	.584	.593	.601	.602	.605	.598	.588	.577	.565	.548	.537	.531	.527	.526	.537	.552	.560	.567
San Diego, Cal	29.805	.805	.802	.795	.790	.788	.787	.795	.801	.810	.816	.818	.820	.814	.806	.798	.789	.780	.775	.773	.772	.780	.789	.800	.796
San Francisco, Cal	29.793	.793	.790	.788	.788	.786	.786	.791	.800	.813	.820	.825	.826	.824	.818	.812	.802	.789	.780	.774	.769	.775	.785	.792	.796
Santa Fe, N. Mex	23.352	.354	.351	.349	.346	.347	.354	.362	.369	.375	.379	.383	.377	.367	.354	.341	.328	.320	.312	.308	.312	.329	.344	.350	.348
Savannah, Ga	29.849	.844	.840	.839	.846	.857	.871	.881	.888	.892	.888	.876	.859	.844	.828	.820	.821	.823	.836	.849	.855	.862	.864	.863	.854
Washington, D. C	29.849	.844	.846	.845	.853	.861	.873	.880	.885	.889	.887	.879	.864	.850	.836	.827	.827	.825	.823	.833	.844	.850	.853	.855	.853
West Indies.																									
Basseterre, St. Kitts	29.908	.899	.895	.897	.903	.915	.927	.933	.939	.939	.934	.922	.903	.893	.882	.875	.879	.890	.906	.924	.939	.941	.934	.921	.912
Bridgetown, Bar	29.876	.861	.864	.866	.875	.885	.895	.903	.907	.903	.892	.874	.857	.848	.841	.841	.849	.861	.875	.888	.897	.896	.889	.878	.876
Cienfuegos, Cuba	29.881	.873	.867	.868	.875	.883	.895	.900	.906	.906	.898	.889	.869	.850	.842	.839	.845	.855	.872	.884	.895	.899	.899	.889	.878
Havana, Cuba	29.900	.892	.887	.883	.888	.896	.908	.915	.922	.924	.927	.918	.906	.890	.875	.870	.868	.869	.876	.882	.898	.906	.909	.905	.896
Kingston, Jamaica	29.630	.619	.611	.611	.615	.622	.635	.635	.641	.636	.620	.606	.583	.571	.565	.564	.567	.578	.601	.613	.633	.641	.641	.637	.611
Port of Spain, Trin	29.822	.815	.815	.818	.829	.842	.857	.867	.869	.864	.851	.831	.809	.790	.782	.782	.789	.799	.816	.835	.848	.852	.847	.836	.828
P. Principe, Cuba	29.580	.567	.561	.559	.565	.5[illegible]3	.583	.589	.595	.596	.588	.575	.558	.541	.524	.525	.530	.545	.557	.571	.581	.590	.593	.587	.568
San Juan, P. R	29.865	.855	.849	.851	.854	.865	.869	.873	.8[illegible]7	.881	.876	.868	.857	.844	.837	.835	.842	.852	.862	.876	.884	.892	.885	.872	.863
Santiago de Cuba	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Santo Domingo, S. D	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Willemstad, Curaçao	29.792	.779	.773	.773	.781	.791	.807	.816	.819	.818	.809	.789	.754	.735	.716	.709	.715	.732	.757	.777	.803	.814	.814	.803	.778

TABLE V.—*Average wind movement for each hour of seventy-fifth meridian time, August, 1899.*

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midnight.	Mean.
Abilene, Tex	8.7	8.8	8.6	8.6	8.3	8.3	7.7	6.9	8.5	11.2	11.6	10.6	9.9	9.2	8.9	9.1	9.5	9.5	9.8	9.7	7.5	6.4	7.3	8.3	8.9
Albany, N. Y	4.1	3.9	4.3	3.6	3.5	3.3	4.1	5.5	6.1	6.0	6.5	6.5	7.1	7.2	7.6	7.9	7.8	7.1	6.5	6.5	5.2	4.4	4.9	4.2	5.6
Alpena, Mich	5.9	5.6	5.6	5.5	5.8	6.0	5.7	6.1	7.8	7.6	8.2	8.9	10.5	11.2	11.0	11.2	10.8	10.5	9.5	7.6	6.5	6.4	6.3	6.0	7.7
Amarillo, Tex	12.0	12.2	11.9	11.5	12.1	12.7	12.5	12.4	12.2	13.9	15.3	14.9	14.1	13.6	13.4	13.9	14.7	14.6	14.9	13.9	12.4	12.3	12.5	12.5	13.2
Atlanta, Ga	8.5	8.3	8.3	8.5	8.1	8.4	8.1	7.6	8.2	8.3	9.1	9.3	9.6	10.0	10.2	10.1	9.6	9.3	9.4	7.9	7.8	7.9	8.3	8.3	8.7
Atlantic City, N. J	8.3	8.6	9.5	9.1	8.9	9.1	9.8	10.8	11.3	11.4	11.5	11.7	12.1	12.1	11.4	11.5	10.9	10.5	9.7	9.1	8.7	8.5	8.6	8.2	10.0
Augusta, Ga	3.7	4.0	4.2	4.0	3.5	3.3	3.6	5.0	6.3	6.7	7.0	7.5	8.4	8.3	8.6	8.2	7.7	8.0	7.3	5.9	5.0	5.2	4.4	4.5	5.9
Baker City, Oreg	3.9	3.7	4.1	4.2	4.6	4.8	5.3	5.9	6.1	5.9	4.0	3.1	3.9	4.3	4.9	5.9	6.4	6.7	6.6	7.1	6.2	5.5	4.9	4.4	5.1
Baltimore, Md	3.6	3.7	3.9	4.4	4.5	4.4	4.6	5.6	6.3	6.6	6.4	6.8	7.1	7.6	7.3	7.1	6.7	6.0	4.5	4.4	4.4	3.9	4.0	3.7	5.3
Bismarck, N. Dak	7.4	6.7	6.8	6.7	7.5	7.2	6.7	7.9	8.8	10.9	12.4	12.9	14.3	13.4	13.5	12.9	12.6	12.2	11.3	9.9	8.0	8.1	7.4	7.2	9.7
Block Island, R. I	9.0	9.6	9.6	9.7	9.8	11.0	10.8	11.6	11.6	12.0	12.0	11.6	10.8	11.3	11.3	11.5	11.8	11.2	10.5	10.2	10.0	9.8	9.1	8.7	10.6
Boise, Idaho	3.7	3.8	3.4	3.4	3.3	2.7	3.2	2.9	2.9	2.4	2.9	3.5	4.3	5.1	5.3	5.4	5.8	5.3	5.8	5.9	5.3	4.9	4.0	3.8	4.1
Boston, Mass	7.4	6.9	6.8	7.1	6.9	6.6	6.7	7.4	7.8	8.0	8.7	9.0	8.9	9.7	9.8	10.3	10.1	9.0	8.4	7.9	8.0	8.3	8.1	7.9	8.2
Buffalo, N. Y	9.2	8.4	8.2	7.8	8.0	8.1	7.7	7.5	7.8	8.9	9.5	11.0	11.5	12.3	12.0	12.3	12.2	11.5	10.2	9.4	9.6	9.4	9.1	8.7	9.6
Cairo, Ill	4.4	4.3	4.2	4.5	4.4	4.4	4.7	4.7	5.8	5.5	5.5	6.1	6.0	6.9	7.2	7.1	7.2	6.9	6.0	5.1	4.8	4.3	3.6	3.9	5.3
Cape Henry, Va	11.6	12.5	12.3	12.6	12.7	13.0	12.9	13.6	14.4	14.5	15.1	16.2	16.9	16.5	16.8	16.4	16.0	14.5	13.9	13.8	14.8	14.0	13.3	12.7	14.2
Carson City, Nev	6.4	6.0	5.1	3.8	3.8	3.7	3.3	2.8	2.7	2.1	3.1	4.0	6.4	8.2	9.6	11.2	11.5	13.3	12.9	13.2	11.0	9.6	8.5	7.2	7.1
Cedar City, Utah	7.3	7.1	6.6	6.5	6.4	6.2	6.5	6.7	6.8	5.5	5.3	7.1	8.5	9.7	11.0	10.9	11.1	10.5	10.6	10.2	8.7	6.3	5.6	6.2	7.8
Charleston, S. C	10.3	9.8	9.8	9.7	9.3	9.0	9.2	10.3	11.2	11.9	12.9	13.0	13.8	14.2	14.4	14.4	14.3	13.4	11.4	10.4	10.6	10.5	10.4	10.9	11.5
Charlotte, N. C	5.1	5.5	5.1	5.5	5.0	5.2	4.6	5.7	5.7	5.9	6.1	5.6	6.3	6.2	6.5	7.0	6.7	6.3	6.0	5.3	5.6	5.6	5.7	5.4	5.7
Chattanooga, Tenn	4.0	3.3	3.4	2.8	3.7	3.1	3.4	3.8	5.5	7.1	6.4	6.8	7.4	7.3	7.4	9.4	10.0	9.3	7.8	6.4	5.3	4.5	4.8	4.3	5.7
Cheyenne, Wyo	8.0	8.1	7.5	7.1	6.8	6.9	7.2	6.6	7.4	8.5	10.5	11.6	13.1	13.8	13.6	13.2	13.5	13.1	12.8	12.7	10.6	8.6	9.3	7.6	9.9
Chicago, Ill	14.0	15.0	13.8	12.9	13.5	13.3	12.9	12.9	12.6	12.2	11.6	13.2	14.8	14.0	14.7	16.2	15.9	15.1	14.3	14.3	14.2	14.7	13.7	13.8	13.8
Cincinnati, Ohio	4.1	4.4	4.4	3.9	3.9	3.7	3.9	4.1	5.5	6.5	7.3	7.7	8.1	8.6	8.3	8.3	8.4	8.0	6.9	5.8	5.4	4.6	4.2	4.4	5.8
Cleveland, Ohio	12.0	12.4	11.0	11.6	11.8	11.1	10.7	10.6	10.5	10.8	11.2	12.5	13.4	13.7	13.7	13.7	13.4	12.1	9.9	9.6	10.1	10.6	10.8	11.7	11.7
Columbia, Mo	6.3	6.1	5.8	5.8	5.7	5.5	5.7	5.0	4.7	4.9	5.6	5.9	6.4	6.3	6.3	7.0	7.0	7.0	5.9	5.4	5.3	5.9	6.3	7.0	6.0
Columbus, Ohio	4.8	4.8	4.5	4.5	4.6	4.6	4.3	5.1	5.6	6.0	6.7	6.9	7.7	8.2	8.2	8.3	8.3	7.8	6.8	6.2	6.1	6.3	5.8	5.6	6.1
Concordia, Kans	6.3	6.1	5.3	5.4	4.7	4.4	4.5	4.6	5.8	7.9	8.5	8.5	8.7	9.1	9.2	9.5	9.5	8.8	7.8	6.2	5.5	5.9	5.9	6.0	6.8
Corpus Christi, Tex	11.8	9.5	8.0	7.2	6.4	5.7	5.8	5.8	7.4	9.9	10.8	11.7	14.8	16.9	17.8	18.7	19.3	19.9	20.7	19.6	18.7	17.1	15.2	13.5	13.0
Davenport, Iowa	5.2	4.6	4.5	4.7	4.6	4.4	4.8	4.9	5.5	6.5	7.3	7.5	8.4	8.4	8.4	8.5	8.0	7.7	6.7	5.0	4.4	4.5	4.7	5.1	6.0
Denver, Colo	6.9	6.5	7.0	7.0	6.4	6.3	6.1	5.5	5.1	5.1	5.7	6.1	6.7	7.5	7.9	9.0	10.1	10.6	11.6	11.9	11.8	8.8	7.7	6.9	7.7
Des Moines, Iowa	4.3	4.5	4.7	4.9	5.2	4.9	4.9	5.1	6.0	6.9	8.3	8.9	9.9	10.6	10.8	10.2	10.3	9.5	8.3	6.5	5.7	5.2	6.0	5.0	6.9
Detroit, Mich	5.9	6.1	6.1	6.1	6.0	6.5	6.2	6.5	7.5	7.8	8.9	8.8	10.2	10.2	10.4	10.6	9.7	9.3	8.2	7.1	6.3	6.2	6.3	6.4	7.6
Dodge, Kans	11.0	11.5	10.4	9.5	9.1	8.9	7.6	7.5	9.2	11.3	12.5	12.4	12.8	13.0	13.4	13.9	14.1	13.7	13.4	10.7	9.9	10.4	10.7	10.5	11.1
Dubuque, Iowa	4.4	4.2	4.3	3.9	3.6	3.6	3.7	4.3	5.7	6.7	7.2	8.0	8.4	8.6	9.0	9.2	8.9	8.5	6.8	5.1	4.1	4.5	4.2	4.1	5.9
Duluth, Minn	7.1	8.4	7.9	7.9	8.1	7.7	7.4	7.2	7.8	8.5	9.2	9.6	10.6	10.9	10.7	11.1	11.4	10.0	9.3	8.5	7.8	8.5	8.4	7.3	8.8
Eastport, Me	5.7	5.9	5.8	6.3	6.1	6.6	6.4	6.8	7.2	7.7	8.3	8.2	8.5	8.4	8.7	9.0	9.1	7.5	7.0	6.6	6.6	6.5	6.3	6.0	7.1
Elkins, W. Va	1.3	1.4	1.2	1.4	1.4	1.3	1.4	1.5	2.2	2.8	4.5	5.5	6.2	6.3	6.1	6.0	5.5	4.9	3.3	2.4	1.7	1.7	1.2	1.3	3.0
El Paso, Tex	10.5	11.1	10.8	10.1	9.5	9.1	8.8	8.2	7.5	8.5	9.3	9.4	9.0	8.1	7.3	8.2	8.5	8.9	8.9	9.8	9.7	9.7	10.5	9.2	9.2
Erie, Pa	7.4	7.6	7.8	7.6	7.1	7.3	7.0	7.6	7.8	8.4	9.7	9.9	9.7	10.1	9.7	9.0	8.7	8.0	7.2	7.2	7.0	7.6	7.8	7.6	8.1
Escanaba, Mich	5.9	5.4	5.5	5.7	6.0	6.3	6.2	6.5	8.0	8.3	8.9	8.9	9.0	9.3	9.5	9.8	9.4	9.5	8.1	7.9	7.6	7.3	6.7	6.0	7.6
Eureka, Cal	3.8	3.8	3.6	3.9	3.7	3.4	3.4	3.4	3.1	2.7	3.1	3.8	4.7	6.1	7.5	8.5	9.4	10.3	9.6	9.1	7.8	6.5	4.7	4.2	5.4
Evansville, Ind	3.7	3.5	3.7	3.9	4.2	4.5	4.2	5.0	5.4	6.2	6.1	6.4	6.5	6.7	7.2	7.5	7.3	6.7	5.6	4.4	3.4	3.8	3.6	2.9	5.1
Fort Canby, Wash	9.2	9.2	9.3	8.7	8.3	7.3	7.5	7.7	6.7	6.2	6.9	7.4	8.6	8.9	9.5	9.1	9.7	9.4	9.3	9.2	9.9	9.4	9.4	9.3	8.6
Fort Smith, Ark	4.3	4.4	4.5	4.5	4.6	4.5	5.1	4.6	4.9	5.2	5.5	5.7	6.2	6.4	6.2	6.3	7.2	7.1	7.4	5.6	5.0	5.0	4.6	3.8	5.3
Fresno, Cal	10.6	10.6	10.0	9.4	8.2	7.1	7.0	6.0	4.8	4.2	4.2	4.5	4.4	5.0	5.2	5.6	5.9	5.8	6.3	6.6	7.1	7.6	9.4	10.4	6.9
Galveston, Tex	6.8	6.9	7.2	6.8	6.8	6.6	5.5	5.6	6.7	7.8	8.2	7.7	7.9	8.9	9.1	9.3	9.3	9.3	8.8	8.0	6.7	6.8	7.1	7.0	7.5
Grand Haven, Mich	5.4	5.9	5.5	5.5	5.2	5.1	5.4	5.8	7.6	8.4	8.9	8.5	8.7	9.3	9.5	9.4	8.5	7.2	5.4	4.7	5.1	4.8	4.7	4.7	6.6
Grand Junction, Colo	5.4	5.4	5.4	5.1	5.9	6.1	5.4	4.9	4.5	6.2	7.1	7.6	6.2	6.4	7.4	6.9	7.0	7.4	7.3	6.4	5.2	4.0	3.8	5.1	5.9
Green Bay, Wis	4.4	4.2	4.1	4.7	5.0	4.9	4.5	4.9	6.5	7.1	7.6	8.3	8.5	9.0	9.1	8.6	7.9	8.3	7.3	5.8	4.6	5.0	4.5	4.5	6.2
Hannibal, Mo	5.4	5.0	5.0	5.5	5.6	5.1	5.6	5.3	5.6	6.8	7.6	7.3	7.6	8.3	8.0	7.7	8.3	7.7	6.2	4.8	4.3	4.5	4.4	4.5	6.1
Harrisburg, Pa	3.4	3.5	3.2	3.5	3.8	3.7	3.8	4.4	5.1	5.9	6.5	6.6	6.4	7.0	7.1	7.1	7.4	6.9	6.1	4.8	4.6	4.5	3.6	3.1	5.1
Hatteras, N. C	12.1	12.0	12.2	12.2	12.8	12.8	13.1	13.8	14.3	14.8	15.0	14.8	15.4	15.4	16.5	16.5	16.7	16.1	14.7	13.6	12.3	13.2	12.7	12.8	14.0
Havre, Mont	7.4	7.9	7.9	7.9	8.3	8.5	7.9	8.1	7.9	9.2	10.4	10.9	11.7	12.3	12.4	12.2	12.2	13.0	12.7	12.6	11.0	9.4	9.2	8.5	10.0
Helena, Mont	7.7	8.0	7.5	7.9	7.5	6.5	6.1	6.2	4.5	3.6	4.3	5.1	6.0	6.7	7.5	9.0	9.0	9.5	9.7	9.4	8.0	6.4	6.7	7.9	7.1
Huron, S. Dak	10.2	10.2	10.5	10.0	10.6	10.9	11.1	10.8	11.8	13.8	14.5	14.7	14.2	15.0	15.6	15.6	15.5	14.2	14.1	13.7	11.9	10.4	9.9	10.6	12.5
Independence, Cal	8.0	6.9	6.3	5.6	5.6	5.6	5.5	5.3	5.4	4.9	6.2	7.0	6.4	6.4	8.2	10.1	11.1	11.9	11.7	10.8	10.6	9.9	9.7	8.5	7.8
Indianapolis, Ind	6.8	6.8	6.2	5.4	5.9	5.5	5.4	6.1	7.0	7.4	8.3	8.5	9.3	9.6	9.7	10.1	9.9	8.7	8.4	6.4	6.5	6.0	6.2	6.6	7.4
Jacksonville, Fla	6.5	6.3	6.2	6.0	5.8	5.6	5.6	6.3	7.0	7.5	7.9	8.0	8.2	8.8	9.5	9.1	9.2	9.0	8.5	7.0	6.5	6.1	6.0	6.7	7.2
Jupiter, Fla	7.5	7.7	7.3	6.9	6.6	6.9	6.8	7.2	8.8	10.0	10.8	11.7	11.8	12.5	11.8	11.9	11.3	10.7	8.3	8.7	8.5	8.3	7.7	7.7	9.1
Kalispell, Mont	4.9	5.2	5.1	4.8	5.4	5.4	5.1	5.0	5.1	4.7	4.2	4.4	5.7	6.2	7.1	8.2	8.0	7.3	8.2	7.0	5.3	4.4	5.0	4.7	5.7
Kansas City, Mo	7.3	6.6	6.4	5.9	6.3	6.0	6.1	6.2	6.7	7.9	8.1	8.1	8.9	9.2	8.9	9.1	9.3	8.5	7.7	6.3	6.2	7.2	6.8	6.8	7.3
Keokuk, Iowa	4.5	4.5	4.5	4.5	5.4	4.5	4.8	5.3	5.4	6.1	6.8	7.0	6.6	7.1	7.1	7.6	7.1	6.8	5.8	4.4	4.0	3.8	3.8	4.4	5.5
Key West, Fla	7.6	6.8	6.5	6.6	6.6	6.5	6.6	7.6	8.1	8.6	8.9	9.3	9.9	9.3	9.5	9.6	9.2	8.7	8.5	7.9	7.7	7.8	7.5	8.0	8.1
Kittyhawk, N. C	11.4	11.4	11.8	11.8	12.2	12.5	14.3	15.0	14.9	14.3	14.2	14.6	15.2	15.6	15.5	15.7	16.0	15.1	14.3	14.2	14.4	13.2	12.6	14.2	13.9
Knoxville, Tenn	4.0	4.1	3.7	3.6	3.9	4.1	3.6	4.6	5.5	5.5	5.8	6.1	6.6	6.4	6.9	7.3	8.2	7.9	7.3	5.9	4.6	4.3	4.1	4.8	5.3
La Crosse, Wis	5.0	5.0	5.2	4.5	4.6	4.4	4.7	4.1	4.6	5.6	6.1	6.8	7.4	7.6	8.0	8.3	7.2	7.3	6.1	5.3	4.5	4.9	4.5	4.7	5.7
Lander, Wyo	5.1	5.1	4.6	3.9	3.7	3.6	2.8	3.0	2.1	2.8	3.6	4.0	5.6	7.1	8.8	8.9	10.1	11.1	9.2	8.6	7.9	6.3	6.0	5.7	5.8
Lexington, Ky	6.6	6.5	6.4	7.3	7.5	6.9	6.9	7.1	7.4	7.8	7.8	8.0	7.4	7.7	7.5	8.1	9.1	8.5	7.2	6.7	7.0	7.1	6.6	6.5	7.3
Little Rock, Ark	3.5	3.5	3.4	3.5	3.4	3.1	3.4	3.5	4.2	4.5	5.4	5.7	6.2	7.2	7.4	7.6	8.6	8.0	6.7	5.7	5.8	4.5	4.4	3.7	5.1
Los Angeles, Cal	2.2	2.1	1.8	1.7	1.4	1.1	1.4	1.4	1.5	1.8	2.3	2.8	4.0	4.6	6.4	7.8	8.7	9.4	8.9	8.5	7.0	5.8	4.5	3.2	4.2
Louisville, Ky	2.1	1.9	2.1	2.5	1.9	2.2	1.8	2.3	2.9	3.0	3.4	3.3	3.3	3.6	3.4	3.2	3.4	3.1	2.6	2.4	2.1	2.3	2.3	2.0	2.6
Lynchburg, Va	1.9	1.5	1.8	1.5	1.9	1.9	2.0	2.4	3.4	4.4	4.4	4.7	4.7	4.6	4.9	4.5	4.8	4.7	3.5	3.3	2.3	2.4	1.9	1.9	3.1
Macon, Ga	4.0	3.5	3.7	3.5	3.7	3.7	3.9	5.4	6.2	6.6	7.8	7.7	8.2	8.6	8.6	9.5	8.7	8.2	6.1	5.4	4.5	4.9	4.7	4.6	5.9
Marquette, Mich	7.8	9.0	8.8	8.2	7.6	7.5	7.8	8.4	9.6	9.9	10.2	10.4	10.6	10.9	10.3	9.3	8.5	7.7	7.0	5.4	5.4	6.4	7.2	7.8	8.4
Memphis, Tenn	3.8	3.5	3.8	3.6	3.8	3.9	3.7	4.1	4.2	4.2	4.2	4.2	4.6	4.7	5.1	5.3	5.8	5.2	4.1	4.2	3.9	3.6	3.8	4.2	4.2
Milwaukee, Wis	8.0	7.9	8.3	8.1	8.4	8.3	8.0	8.1	9.0	10.0	10.5	10.5	11.5	12.6	12.6	12.9	12.1	11.5	9.8	8.5	8.3	8.4	8.1	8.7	9.6
Minneapolis, Minn	9.4	9.1	9.2	9.1	8.5	8.9	9.1	9.2	8.2	9.2	10.0	10.5	9.7	9.3	10.5	11.4	10.5	10.5	10.3	10.1	10.2	10.0	9.6	9.4	9.7
Mobile, Ala	4.0	4.4	4.5	4.3	4.5	4.2	4.4	4.6	5.3	6.3	6.8	7.0	7.9	8.9	9.0	9.6	10.3	10.1	8.1	6.2	5.2	4.9	5.1	4.4	6.2
Montgomery, Ala	4.5	4.0	3.7	4.2	4.2	3.8	3.4	4.4	5.4	6.3	6.7	6.8	7.3	7.4	8.0	7.8	7.4	6.3	6.0	4.9	4.7	4.4	4.1	4.5	5.4
Moorhead, Minn	8.4	7.9	8.4	8.5	9.2	8.9	8.8	9.5	10.5	11.0	11.9	12.3	12.4	12.5	12.1	12.2	12.3	11.6	11.4	10.2	8.6	8.0	8.5	8.4	10.2
Mount Tamalpais, Cal	24.2	25.0	22.0	21.2	20.1	20.5	18.8	17.2	16.0	14.2	11.8	9.9	8.4	7.5	8.0	10.1	11.8	12.9	14.3	17.2	18.9	21.2	21.9	23.4	16.5
Nantucket, Mass	6.9	7.7	8.3	8.7	9.4	8.9	9.1	9.8	9.9	10.2	10.5	10.6	10.7	10.2	9.9	10.2	9.3	8.1	7.1	7.6	7.5	7.3	7.3	7.4	8.9
Nashville, Tenn	2.2	2.3	2.2	2.1	2.2	2.6	2.8	3.9	4.6	5.7	6.1	6.5	6.5	6.8	7.4	7.3	7.9	7.6	6.9	5.7	4.4	3.6	2.7	2.5	4.7
Neah, Wash	5.1	5.0	5.1	4.7	4.5	4.2	3.9	3.3	3.7	3.2	3.5	4.2	5.1	5.9	6.8	7.6	8.7	9.2	8.9	7.9	7.5	7.2	6.4	5.4	5.7

TABLE V.—*Average wind movement, etc.*—Continued.

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midnight.	Mean.
New Haven, Conn	5.3	5.9	5.5	5.5	4.9	5.0	5.8	6.5	7.6	8.0	8.5	8.8	9.9	10.0	9.5	9.0	8.2	7.1	6.1	5.8	5.0	4.5	5.2	5.2	6.8
New Orleans, La	4.8	4.5	4.9	4.5	5.0	4.8	4.7	5.0	6.6	8.1	8.3	8.0	8.7	8.6	7.9	8.7	9.5	8.2	8.0	7.3	5.9	5.6	5.0	4.7	6.6
New York, N. Y	7.9	8.2	7.4	7.5	8.0	7.9	8.6	9.0	9.0	9.3	9.5	9.3	9.7	10.0	10.0	10.2	11.2	9.9	10.0	9.8	10.1	9.5	8.3	7.4	9.1
Norfolk, Va	8.1	7.8	7.5	7.6	7.8	7.4	7.7	8.5	9.5	9.6	10.2	10.8	11.2	11.3	11.5	11.9	12.1	11.3	11.1	10.1	9.8	9.0	9.3	8.1	9.5
Northfield, Vt	6.0	5.5	5.5	5.5	4.6	4.0	3.3	4.4	6.7	8.5	9.2	9.9	10.4	10.7	10.7	11.5	11.1	9.4	7.1	6.3	6.5	6.8	6.4	6.3	7.4
North Platte, Nebr	8.8	8.5	8.3	7.8	6.8	6.4	6.5	6.1	6.8	7.9	9.3	10.4	11.4	11.3	10.8	10.3	10.4	11.2	11.1	10.6	9.2	9.3	10.1	8.9	9.1
Oklahoma, Okla	7.5	7.7	7.1	6.9	7.1	6.8	6.9	7.5	8.3	9.8	9.8	10.4	9.5	9.7	10.0	10.0	10.0	9.9	9.2	8.1	6.5	6.7	7.3	7.6	8.3
Omaha, Nebr	6.2	6.8	6.4	7.3	6.4	6.3	5.2	6.0	6.4	7.6	7.2	7.8	8.7	8.8	8.7	8.9	9.7	9.1	8.2	6.6	6.0	5.9	6.5	7.2	7.2
Oswego, N. Y	7.7	7.1	7.1	7.0	7.6	7.2	7.7	7.6	6.7	7.3	8.4	9.2	9.5	8.9	8.7	8.2	7.8	7.0	6.0	5.7	5.9	6.5	7.2	7.0	7.5
Palestine, Tex	4.8	5.0	5.1	5.1	4.9	4.5	4.6	5.0	6.2	7.5	7.5	6.8	6.6	6.5	6.6	6.9	6.8	6.9	6.1	4.4	3.5	3.5	4.5	4.9	5.6
Parkersburg, W. Va	2.4	2.6	2.1	2.7	2.5	2.8	3.0	3.4	4.2	4.6	5.2	5.3	6.0	6.2	6.8	6.7	6.2	5.7	4.6	3.4	2.9	3.2	3.3	2.8	4.1
Pensacola, Fla	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Phenix, Ariz	4.0	3.4	3.1	3.6	3.3	3.7	3.5	3.6	3.7	4.5	4.6	4.6	4.8	4.9	5.1	5.6	6.0	6.0	6.0	5.7	4.9	4.7	4.2	4.4	4.5
Philadelphia, Pa	7.5	7.5	7.8	7.5	7.5	7.6	8.1	8.9	9.5	9.5	9.4	9.2	9.8	9.7	9.7	9.7	9.7	9.4	8.5	8.7	8.5	8.3	7.0	6.8	8.6
Pierre, S. Dak	10.8	10.2	9.7	9.1	8.8	8.5	9.0	10.1	10.7	13.0	14.6	15.4	15.6	14.7	14.7	13.9	13.6	14.0	13.9	13.8	11.8	11.4	11.5	12.0	12.1
Pittsburg, Pa	2.5	2.2	1.9	2.2	2.4	2.8	3.3	3.5	3.8	4.3	4.6	4.5	4.5	5.0	4.5	4.7	4.8	4.6	4.1	3.6	3.2	3.0	3.0	2.9	3.6
Pocatello, Idaho	8.3	9.7	11.1	11.0	10.2	9.5	10.1	9.8	8.9	8.3	8.7	8.5	9.5	10.6	10.8	11.6	12.9	12.6	12.5	12.1	11.1	8.0	6.9	7.5	10.0
Point Reyes Lt., Cal	22.7	22.5	21.4	20.9	19.6	18.6	17.6	18.0	17.8	17.7	16.8	15.9	14.4	13.4	14.5	15.6	16.7	17.0	17.8	19.9	21.0	22.6	23.6	23.2	18.7
Port Crescent, Wash	3.6	3.4	3.2	3.1	2.8	2.9	2.5	2.6	2.3	2.5	2.8	4.0	5.3	5.9	6.5	6.9	7.3	7.2	6.6	6.9	6.5	6.0	4.9	4.5	4.6
Port Huron, Mich	7.6	7.4	6.7	6.8	6.9	6.8	7.0	7.2	8.1	8.9	9.6	10.2	11.8	11.6	11.5	12.0	12.0	11.5	10.7	9.6	9.0	8.7	8.4	7.5	9.1
Portland, Me	4.3	3.9	4.1	4.1	4.6	4.1	4.2	4.9	5.5	6.2	6.8	7.5	8.7	10.1	9.8	8.9	8.2	7.4	6.3	5.5	5.5	4.7	4.5	4.5	6.0
Portland, Oreg	7.8	7.6	6.1	5.5	5.1	4.6	4.7	4.8	4.8	5.4	6.1	7.0	8.0	7.9	8.0	8.2	8.9	8.8	8.6	9.2	9.3	8.2	8.9	8.5	7.2
Pueblo, Colo	5.5	5.5	4.9	4.5	4.2	4.4	4.1	3.7	5.5	3.7	4.6	5.9	6.6	8.2	8.4	9.0	10.3	11.2	10.5	8.7	8.9	7.3	7.0	6.2	6.5
Raleigh, N. C	4.3	5.0	5.2	5.0	4.8	4.7	4.6	5.4	5.7	6.1	6.5	6.8	7.2	7.0	7.0	6.5	6.2	5.3	4.9	5.4	5.4	5.0	5.1	5.0	5.6
Rapid City, S. Dak	4.9	4.7	5.1	5.1	4.7	4.2	4.5	4.7	4.6	4.9	5.0	5.5	6.0	6.3	6.2	6.1	6.4	6.1	6.5	6.5	5.6	4.6	4.6	4.7	5.3
Red Bluff, Cal	6.4	6.3	6.1	5.5	4.7	4.4	4.2	4.2	3.8	4.0	5.0	5.3	5.1	5.9	6.3	7.1	8.0	8.1	8.2	8.4	7.8	7.1	7.0	6.6	6.1
Richmond, Va	5.3	5.0	4.9	5.3	5.2	5.2	5.5	6.4	6.9	7.3	7.4	7.5	7.7	7.9	8.2	8.2	8.1	7.4	6.4	5.5	5.4	5.7	5.3	4.9	6.3
Rochester, N. Y	4.1	4.0	3.8	4.5	4.4	4.4	5.2	5.4	5.7	5.5	6.0	6.3	7.5	8.2	8.6	8.2	7.6	6.9	5.2	4.0	3.8	3.6	3.9	4.1	5.4
Roseburg, Oreg	2.4	1.7	1.7	1.8	1.5	1.8	2.1	2.0	1.9	2.0	2.6	2.8	3.5	4.2	4.9	5.8	5.9	7.4	7.5	8.0	8.6	7.3	4.3	3.4	4.0
Sacramento, Cal	10.5	9.9	9.6	10.4	10.5	10.1	10.5	10.2	9.5	9.8	9.7	9.6	9.9	9.6	9.9	10.5	10.9	11.2	11.8	12.0	11.8	11.1	10.6	10.7	10.4
St. Louis, Mo	7.2	6.4	6.2	5.9	6.4	6.2	5.8	5.6	6.2	6.9	7.2	7.7	8.0	7.7	8.5	8.2	8.5	8.9	8.5	7.6	6.8	7.0	7.3	7.0	7.2
St. Paul, Minn	5.7	5.3	5.5	5.1	4.0	4.5	4.4	5.0	5.4	6.7	8.2	8.5	8.7	9.4	9.7	9.9	9.3	8.9	8.0	7.4	7.0	6.6	6.3	5.9	6.9
Salt Lake City, Utah	6.0	5.1	5.3	4.9	4.4	3.8	3.9	4.3	4.3	3.4	4.0	5.6	9.2	8.7	10.0	10.2	10.6	10.3	10.2	8.6	6.9	6.8	6.1	6.1	6.6
San Antonio, Tex	9.0	7.1	5.6	4.5	3.9	3.4	3.8	3.7	5.1	7.3	7.4	7.1	7.6	8.3	8.4	8.6	8.6	8.8	10.2	11.3	13.5	15.1	14.0	11.9	8.1
San Diego, Cal	2.9	2.7	2.8	2.9	3.2	3.1	3.0	2.9	3.3	3.2	3.5	5.8	8.2	10.2	11.1	11.5	11.3	11.3	10.4	9.6	8.5	6.6	4.9	3.6	6.1
Sandusky, Ohio	7.2	7.0	6.8	6.7	6.4	6.2	6.4	5.9	6.8	6.9	7.1	7.7	8.6	8.4	8.7	8.5	7.6	7.5	6.7	7.1	6.7	6.1	5.9	6.6	7.1
Sandy Hook, N. J	11.9	13.2	12.5	13.4	13.0	14.2	13.7	13.9	13.2	12.1	11.7	10.8	11.5	12.2	13.3	13.4	12.3	11.9	11.9	12.3	13.0	13.2	12.3	12.4	12.6
San Francisco, Cal	12.2	11.7	11.9	11.2	10.7	9.9	9.4	9.2	9.4	9.0	9.5	10.0	11.5	13.2	15.9	19.2	20.9	22.2	22.6	23.0	22.4	19.7	17.1	14.2	14.4
San Luis Obispo, Cal	2.8	2.2	2.3	2.3	2.3	2.2	2.6	2.6	3.0	3.3	3.9	4.6	4.6	5.5	6.6	8.3	9.3	9.5	9.1	8.6	7.6	5.9	4.5	3.5	4.9
Santa Fe, N. Mex	4.7	4.9	3.8	4.3	3.6	3.4	3.2	3.0	3.0	3.0	4.5	6.0	6.6	7.8	8.4	9.1	9.2	9.9	8.2	7.7	6.5	5.3	4.5	4.9	5.6
Sault Ste. Marie, Mich	4.4	4.4	4.2	3.8	3.7	3.8	4.0	4.5	5.5	6.3	7.5	8.5	9.0	9.5	10.7	11.1	11.3	10.8	9.4	7.9	7.2	5.6	4.6	4.7	6.8
Savannah, Ga	6.7	6.8	6.6	6.4	6.8	6.3	6.2	6.7	7.9	8.3	8.8	9.4	10.5	10.9	12.0	11.9	11.1	10.3	8.2	7.9	7.3	7.4	7.0	6.3	8.2
Seattle, Wash	3.9	3.4	3.6	3.8	3.3	3.5	3.5	3.5	3.7	3.9	4.6	5.0	5.4	5.7	6.0	6.7	6.7	6.7	7.1	6.6	5.9	5.6	4.8	4.5	4.9
Shreveport, La	5.1	4.5	3.9	3.6	3.4	3.2	3.5	3.6	5.5	6.6	6.0	5.8	5.9	6.2	6.4	6.4	7.3	7.3	7.1	5.9	5.5	5.3	5.2	5.0	5.3
Sioux City, Iowa	11.3	10.9	10.5	10.6	9.6	9.4	9.9	10.0	9.9	11.7	12.7	12.5	14.6	14.9	15.0	15.0	15.6	14.1	12.9	12.0	11.4	11.0	11.1	10.8	12.0
Spokane, Wash	4.7	4.3	4.9	4.8	4.8	5.2	4.6	4.3	4.1	4.8	6.5	6.6	7.2	7.2	7.5	7.9	7.4	7.6	7.1	6.8	6.5	5.7	4.9	4.5	5.8
Springfield, Ill	6.3	6.2	5.7	5.9	5.1	5.3	5.9	6.0	6.5	6.1	7.0	7.4	7.9	8.2	8.6	8.3	8.1	8.1	7.2	5.5	5.3	5.6	6.0	6.2	6.6
Springfield, Mo	8.3	8.4	8.0	7.7	7.6	7.8	7.4	7.1	7.5	8.6	8.3	8.5	8.5	8.5	9.0	9.6	10.2	10.0	9.3	8.5	7.6	8.0	8.4	8.5	8.4
Tacoma, Wash	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tampa, Fla	4.1	3.9	3.7	4.0	3.8	4.0	3.6	4.3	6.0	6.6	6.8	7.3	7.7	8.5	8.9	10.0	9.2	8.8	6.5	5.1	4.1	3.5	3.6	3.7	5.7
Toledo, Ohio	7.1	6.8	7.2	6.6	6.9	6.0	5.9	6.9	8.0	8.4	9.3	10.3	10.7	11.4	11.3	10.9	10.1	9.9	8.7	7.1	7.3	7.1	7.6	7.1	8.3
Vicksburg, Miss	5.2	4.8	5.0	4.8	5.0	4.9	4.7	5.0	5.3	5.5	5.4	5.1	5.2	5.5	6.0	6.2	6.5	6.2	4.5	4.2	4.1	4.6	5.0	4.7	5.1
Vineyard Haven, Mass	4.9	5.0	5.1	5.3	5.5	5.5	5.8	6.3	6.9	7.5	8.0	7.6	7.2	7.7	7.8	7.7	7.0	6.1	5.7	5.2	5.2	5.4	5.1	5.1	6.2
Walla Walla, Wash	5.5	5.9	5.7	6.1	5.8	6.0	6.0	5.9	5.6	5.3	6.1	6.5	6.5	6.5	6.7	6.5	6.7	7.0	6.6	6.1	5.9	5.3	5.3	5.8	6.0
Washington, D. C	3.1	3.7	3.9	3.9	4.5	4.9	4.5	5.9	6.7	7.0	7.2	7.5	8.0	8.1	7.9	7.9	7.1	5.5	4.1	3.9	3.8	3.4	3.5	3.2	5.4
Wichita, Kans	8.0	7.5	7.1	6.6	6.8	6.5	6.6	6.7	7.8	8.5	9.1	9.2	10.3	10.7	10.8	10.9	10.2	9.3	9.1	8.4	8.0	8.1	8.0	8.5	8.5
Williston, N. Dak	8.5	8.1	7.9	7.8	7.2	7.3	5.9	5.9	7.3	10.3	12.1	12.7	14.2	13.7	13.7	13.7	13.5	12.7	12.1	11.0	10.0	9.3	8.8	9.0	10.1
Wilmington, N. C	7.2	7.4	7.0	6.9	6.7	7.1	7.1	7.5	8.0	8.7	8.9	9.3	10.1	10.1	10.7	10.8	10.3	9.3	8.2	7.8	7.8	7.3	7.5	7.2	8.3
Winnemucca, Nev	7.6	7.8	8.6	8.5	8.2	8.0	8.0	6.8	6.7	6.6	6.2	7.8	8.8	10.7	11.3	11.9	11.8	12.5	12.5	13.8	12.5	9.8	7.5	7.5	9.2
Woods Hole, Mass	7.7	7.7	7.9	8.5	8.4	8.5	8.6	8.5	8.7	9.0	9.8	10.1	9.5	10.2	10.1	9.9	9.4	9.1	8.6	7.2	7.2	7.5	6.9	7.0	8.6
Yankton, S. Dak	7.4	7.0	6.9	6.4	6.5	6.9	7.2	7.7	8.6	8.4	9.8	11.0	11.7	11.3	11.3	11.5	11.0	10.0	9.4	8.9	7.9	8.1	7.5	7.1	8.7
West Indies.																									
Basseterre, St. Kitts	10.6	10.4	10.3	10.6	10.8	10.8	11.7	13.0	13.6	13.8	13.7	13.6	13.2	13.2	12.9	12.6	12.9	12.0	11.4	11.9	11.9	11.5	11.2	10.8	12.0
Bridgetown, Bar	5.3	5.3	5.7	5.7	5.6	6.0	9.1	12.2	12.7	14.0	14.4	13.8	13.4	13.1	12.6	11.1	9.5	6.9	5.9	6.2	6.3	6.0	5.5	5.5	8.8
Cienfuegos, Cuba	5.5	5.9	5.4	5.6	5.4	5.5	5.0	5.4	5.7	6.5	7.1	7.1	8.0	9.2	9.4	9.4	8.9	6.9	5.5	6.5	5.8	5.5	4.9	5.4	6.5
Havana, Cuba	4.6	4.5	3.9	4.1	3.8	3.8	4.0	4.7	7.6	9.3	10.4	11.8	13.8	15.3	15.6	15.2	14.5	12.8	11.8	9.7	8.9	7.6	6.8	5.8	8.8
Kingston, Jamaica	4.3	4.5	4.7	4.9	5.0	5.0	4.5	4.1	4.3	6.2	8.7	12.9	15.0	15.2	15.5	13.0	10.0	7.2	4.7	3.8	4.0	4.0	4.2	4.1	7.1
Port of Spain, Trin	3.0	2.3	2.4	2.2	2.5	2.7	3.1	5.1	6.2	7.0	7.3	6.7	7.0	7.1	7.0	6.9	6.1	4.8	3.9	3.0	3.0	3.1	3.0	2.6	4.5
Puerto Principe, Cuba	4.4	4.2	4.1	3.8	4.3	3.7	4.6	8.5	11.9	11.1	10.5	9.5	9.3	9.8	10.2	11.8	11.9	10.1	7.7	5.9	5.5	5.0	4.5	4.6	7.4
San Juan, Porto Rico	4.4	4.3	4.2	3.9	4.1	4.4	5.0	7.4	9.6	10.5	11.3	11.2	11.9	11.8	11.6	11.1	9.8	8.8	8.0	7.9	6.8	6.3	5.6	5.2	7.7
Santiago de Cuba	3.2	2.8	3.1	3.5	3.5	3.4	3.6	4.7	6.2	6.3	6.7	7.4	8.6	8.3	8.1	7.9	6.6	5.2	3.5	3.4	3.4	3.1	2.9	3.1	4.9
Santo Domingo, S. D	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Willemstad, Curaçao	10.2	9.8	9.7	9.4	9.0	8.9	10.1	11.9	13.0	13.3	13.9	14.4	14.9	14.4	14.7	14.5	14.2	13.4	12.8	12.4	11.8	10,8	10.5	10.2	12.0

TABLE VI.—*Resultant winds from observations at 8 a. m. and 8 p. m., daily, during the month of August, 1899.*

Stations.	Component direction from— N.	S.	E.	W.	Resultant. Direction from—	Duration.	Stations.	Component direction from— N.	S.	E.	W.	Resultant. Direction from—	Duration.
New England.	*Hours.*	*Hours.*	*Hours.*	*Hours.*	°	*Hours.*	*North Dakota*—Continued.	*Hours.*	*Hours.*	*Hours.*	*Hours.*	°	*Hours.*
Eastport, Me	18	21	13	20	s. 67 w.	8	Williston, N. Dak	18	16	17	19	n. 45 w.	3
Portland, Me	19	25	12	19	s. 49 w.	9	*Upper Mississippi Valley.*						
Northfield, Vt	14	37	9	6	s. 7 e.	23	St. Paul, Minn	16	28	23	11	s. 45 e.	17
Boston, Mass	19	19	23	15	e.	8	La Crosse, Wis. †	7	15	12	7	s. 32 e.	9
Nantucket, Mass	15	27	21	14	s. 30 e.	14	Davenport, Iowa	17	18	33	11	s. 87 e.	22
Woods Hole, Mass	23	21	21	12	n. 77 e.	9	Des Moines, Iowa	13	32	26	5	s. 48 e.	28
Block Island, R. I	21	20	24	16	n. 83 e.	8	Dubuque, Iowa	16	24	22	15	s. 41 e.	11
New Haven, Conn	22	21	25	11	n. 86 e.	14	Keokuk, Iowa	12	26	25	15	s. 36 e.	17
Middle Atlantic States.							Cairo, Ill	19	27	18	11	s. 41 e.	11
Albany, N. Y	19	29	14	13	s. 6 e.	10	Springfield, Ill	15	19	28	14	s. 74 e.	15
Binghamton, N. Y. †	14	7	10	8	n. 16 e.	7	Hannibal, Mo. †	7	10	11	7	s. 53 e.	5
New York, N. Y	21	11	32	13	n. 62 e.	22	St. Louis, Mo	19	23	23	9	s. 74 e.	15
Harrisburg, Pa. †	15	5	13	7	n. 31 e.	12	*Missouri Valley.*						
Philadelphia, Pa	22	14	26	14	n. 56 e.	14	Columbia, Mo.*	6	11	19	2	s. 74 e.	18
Atlantic City, N. J	19	19	28	10	e.	18	Kansas City, Mo	13	29	33	5	s. 60 e.	32
Cape May, N. J	26	17	23	10	n. 55 e.	16	Springfield, Mo	7	33	27	9	s. 35 e.	32
Baltimore, Md	22	14	28	12	n. 63 e.	18	Lincoln, Nebr	12	29	34	6	s. 59 e.	33
Washington, D. C	27	16	23	9	n. 52 e.	18	Omaha, Nebr	12	23	39	5	s. 72 e.	36
Lynchburg, Va	27	13	25	13	n. 41 e.	18	Sioux City, Iowa †	8	15	10	3	s. 45 e.	10
Norfolk, Va	20	21	30	3	s. 88 e.	27	Pierre, S. Dak	14	21	34	9	s. 74 e.	26
Richmond, Va	30	23	16	3	n. 62 e.	15	Huron, S. Dak	17	26	27	10	s. 62 e.	19
South Atlantic States.							Yankton, S. Dak †	5	13	11	7	s. 27 e.	9
Charlotte, N. C	22	17	29	14	n. 72 e.	16	*Northern Slope.*						
Hatteras, N. C	25	18	14	17	n. 23 w.	8	Havre, Mont	16	14	19	29	n. 79 w.	10
Raleigh, N. C	28	14	23	12	n. 38 e.	18	Miles City, Mont	19	15	21	20	n. 14 e.	4
Wilmington, N. C	15	17	20	26	s. 72 w.	6	Helena, Mont	11	25	5	38	s. 67 w.	36
Charleston, S. C	15	18	17	24	s. 67 w.	8	Kalispell, Mont	18	22	14	26	s. 72 w.	13
Augusta, Ga	17	25	23	16	s. 41 e.	11	Rapid City, S. Dak	16	20	23	20	s. 37 w.	5
Savannah, Ga	20	19	9	23	n. 86 w.	14	Cheyenne, Wyo	16	25	8	26	s. 63 w.	20
Jacksonville, Fla	13	25	9	27	s. 56 w.	22	Lander, Wyo	14	26	13	24	s. 43 w.	16
Florida Peninsula.							North Platte, Nebr	10	29	25	12	s. 34 e.	23
Jupiter, Fla	16	29	18	23	s. 21 w.	14	*Middle Slope.*						
Key West, Fla	13	14	31	15	s. 87 e.	16	Denver, Colo	15	27	9	21	s. 45 w.	17
Tampa, Fla	17	10	20	27	n. 45 w.	10	Pueblo, Colo	20	20	19	22	w.	3
Eastern Gulf States.							Concordia, Kans	8	32	34	3	s. 52 e.	39
Atlanta, Ga	21	10	18	25	n. 32 w.	13	Dodge, Kans	9	32	32	6	s. 48 e.	35
Macon, Ga †	8	5	10	10	n.	3	Wichita, Kans	7	30	29	4	s. 47 e.	34
Pensacola, Fla. †	17	5	5	15	n. 40 w.	16	Oklahoma, Okla	2	43	22	1	s. 27 e.	46
Mobile, Ala	25	23	7	24	n. 83 w.	17	*Southern Slope.*						
Montgomery, Ala	20	18	19	20	n. 27 w.	2	Abilene, Tex	2	43	37	1	s. 41 e.	55
Meridian, Miss. †	7	13	7	14	s. 49 w.	9	Amarillo, Tex	2	46	14	13	s. 1 e.	44
Vicksburg, Miss	15	27	18	22	s. 18 w.	13	*Southern Plateau.*						
New Orleans, La	14	26	8	23	s. 51 w.	19	El Paso, Tex	22	10	18	27	n. 37 w.	15
Western Gulf States.							Santa Fe, N. Mex	14	24	28	15	s. 52 e.	16
Shreveport, La	8	30	21	16	s. 13 e.	23	Flagstaff, Ariz	12	20	3	42	s. 79 w.	40
Fort Smith, Ark	11	8	40	8	n. 85 e.	32	Phenix, Ariz	17	7	24	23	n. 6 e.	10
Little Rock, Ark	17	29	20	12	s. 34 e.	14	Yuma, Ariz	7	20	17	30	s. 45 w.	18
Corpus Christi, Tex	0	45	31	3	s. 32 e	53	Independence, Cal	14	25	13	26	s. 50 w.	17
Fort Worth, Tex †	1	21	6	12	s. 17 w.	21	*Middle Plateau.*						
Galveston, Tex	6	40	6	26	s. 30 w.	39	Carson City, Nev	12	17	5	29	s. 78 w.	24
Palestine, Tex	9	39	10	20	s. 18 w.	32	Winnemucca, Nev	14	21	14	30	s. 66 w.	18
San Antonio, Tex	2	42	37	1	s. 42 e.	54	Cedar City, Utah	4	42	20	20	s.	38
Ohio Valley and Tennessee.							Salt Lake City, Utah	17	31	22	9	s. 43 e.	19
Chattanooga, Tenn	21	17	14	25	n. 70 w.	12	Grand Junction, Colo	16	23	28	14	s. 63 e.	16
Knoxville, Tenn	34	13	22	12	n. 25 e.	23	*Northern Plateau.*						
Memphis, Tenn	19	24	15	21	s. 50 w.	8	Baker City, Oreg	20	25	12	18	s. 50 w.	8
Nashville, Tenn	30	13	20	17	n. 10 e.	17	Boise, Idaho	18	15	21	24	n. 45 w.	4
Lexington, Ky. †	8	13	15	5	s. 63 e.	11	Pocatello, Idaho	8	32	14	21	s. 16 w.	25
Louisville, Ky	24	23	17	10	n. 82 e.	7	Spokane, Wash	14	28	10	22	s. 41 w.	18
Evansville, Ind. †	10	9	17	2	n. 86 e.	15	Walla Walla, Wash	6	37	5	21	s. 27 w.	35
Indianapolis, Ind	20	21	25	11	s. 86 e.	14	*North Pacific Coast Region.*						
Cincinnati, Ohio	18	16	25	16	n. 77 e.	9	Fort Canby, Wash	34	10	3	20	n. 35 w.	29
Columbus, Ohio	25	15	27	10	n. 60 e.	20	Neah, Wash	4	10	11	45	s. 80 w.	34
Pittsburg, Pa	22	18	20	20	n.	4	Port Crescent, Wash.*	0	1	6	24	s. 87 w.	18
Parkersburg, W. Va	27	18	23	8	n. 59 e.	18	Seattle, Wash	16	26	17	16	s. 6 e.	10
Elkins, W. Va	23	16	18	17	n. 8 e.	7	Portland, Oreg	24	22	9	25	n. 83 w.	16
Lower Lake Region.							Roseburg, Oreg	34	7	22	13	n. 18 e.	28
Buffalo, N. Y	20	15	21	22	n. 11 w.	5	*Middle Pacific Coast Region.*						
Oswego, N. Y	13	30	21	17	s. 13 e.	18	Eureka, Cal	27	18	4	16	n. 53 w.	15
Rochester, N. Y	18	17	18	27	n. 83 w.	8	Mount Tamalpais, Cal	19	2	1	44	n. 68 w.	46
Erie, Pa	21	18	17	17	n.	3	Red Bluff, Cal	13	33	23	7	s. 39 e.	26
Cleveland, Ohio	23	13	27	16	n. 48 e.	15	Sacramento, Cal	4	34	6	27	s. 35 w.	37
Sandusky, Ohio	17	16	31	13	n. 87 e.	18	San Francisco, Cal	1	20	1	53	s. 70 w.	56
Toledo, Ohio	18	14	23	16	n. 60 e.	8	*South Pacific Coast Region.*						
Detroit, Mich	21	16	23	15	n. 58 e.	9	Fresno, Cal	33	4	0	45	n. 57 w.	54
Upper Lake Region.							Los Angeles, Cal	2	19	3	43	s. 67 w.	44
Alpena, Mich	23	21	15	16	n. 27 w.	2	San Diego, Cal	32	8	2	37	n. 56 w.	42
Escanaba, Mich	27	22	14	9	n. 45 e.	7	San Luis Obispo, Cal	16	10	4	38	n. 80 w.	34
Grand Haven, Mich	22	15	23	20	n. 23 e.	8	*West Indies.*						
Marquette, Mich	22	21	19	16	n. 72 e.	3	Basseterre, St. Kitts Island	14	1	56	0	n. 78 e.	58
Port Huron, Mich	26	21	18	8	n. 63 e.	11	Bridgetown, Barbados	9	7	53	0	n. 82 e.	53
Sault Ste. Marie, Mich	12	10	29	22	n. 74 e.	7	Cienfuegos, Cuba	37	7	30	3	n. 42 e.	40
Chicago, Ill	22	17	35	11	n. 78 e.	24	Havana, Cuba	14	9	46	7	n. 83 e.	39
Milwaukee, Wis	9	22	21	19	s. 34 e.	4	Kingston, Jamaica	42	9	19	6	n. 65 e.	60
Green Bay, Wis	16	22	25	11	s. 67 e.	15	Puerto Principe, Cuba	18	11	40	7	n. 78 e.	34
Duluth, Minn	37	7	24	16	n. 15 e.	31	Port of Spain, Trinidad	10	8	50	1	n. 88 e.	49
North Dakota.							San Juan, Porto Rico	2	20	51	2	s. 70 e.	52
Moorhead, Minn	21	22	28	14	s. 86 e.	14	Santiago de Cuba, Cuba	30	19	22	4	n. 59 e.	21
Bismarck, N. Dak	18	8	30	17	n. 52 e.	16	Willemstad, Curaçao	3	8	58	0	s. 86 e.	58

* From observations at 8 p. m. only

† From observations at 8 a. m. only.

TABLE VII.—*Thunderstorms and auroras, August, 1899.*

States.	No. of stations.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total. No.	Total. Days.	
Alabama	53	T.		3	2	2	2	3	5	4	3	4	4	6	4	4	7	5	2	4	7	3	4	4	5	3	7	7	5	5	2	2	4	122	30	T.
		A.																																0	0	A.
Arizona	53	T.	9	13	5	3	7	6	4	3	2	1	3	1	1	3	12		1					1			1	1	5	9	14	5	5	115	24	T.
		A.																																0	0	A.
Arkansas	57	T.	1	1	4	4	1	4	8					3	15	8	3	3	3	3		4	1		1	3	9	8	9	1	1	3	3	104	25	T.
		A.																																0	0	A.
California	189	T.	2	3	19	17	6	10	3						1			1	2		1													65	11	T.
		A.																																0	0	A.
Colorado	73	T.	13	15	7	13	10	10	2	1				5	12	2	14	13	3	2				2	1				5	11	10	14	7	172	22	T.
		A.																																0	0	A.
Connecticut	22	T.		3			2				1	1			2							1	8	4	8	3								33	10	T.
		A.																																0	0	A.
Delaware	5	T.		1			1					1	1			1	1						2					1						9	8	T.
		A.																																0	0	A.
Dist. of Columbia	4	T.		1		1	1	1				1	1		1	1							1					1						10	10	T.
		A.																																0	0	A.
Florida	45	T.	2	4	2	2	2	9	11	13	9	5	9	10	10	5	4	8	9	8	6	8	9	5	5	6	5	8	11	8	8	7	10	218	31	T.
		A.																																0	0	A.
Georgia	54	T.	5	2			3	5	4	3	4	6	4	6	4	3	4				2	1	2	2	3	4	6	4	6	2	1	1	3	90	26	T.
		A.																																0	0	A.
Idaho	27	T.	1			2	4	3	8	8	4		1	2		3	1	1	3	5	2	6	1							1		2	3	61	20	T.
		A.																																0	0	A.
Illinois	92	T.	18	3	10	18	9	9		9	14	19	16	3	5	1	1			1	1	19	2		2	9	3	4	9				1	186	24	T.
		A.																																0	0	A.
Indiana	55	T.	5	11	4	13	12	2		1	17	8	13	8	3							3	7			1	11	11					1	131	18	T.
		A.									1																							1	1	A.
Indian Territory	8	T.														1											1							2	2	T.
		A.																																0	0	A.
Iowa	126	T.	26	11	12	13	4		8	5	14	1	7	9	3				1	5	11	20	3	14	18	7		3		1	4		4	204	23	T.
		A.																																0	0	A.
Kansas	74	T.			3	15	5	4	7		16	7	12	13	12	10	1		2	1	2		2	1	11	9	13	9	5			1	1	162	24	T.
		A.																													1			1	1	A.
Kentucky	45	T.		1		3	14	7		1	7	9	11	13	5		1					1	6				1	9	1	1				91	17	T.
		A.																																0	0	A.
Louisiana	45	T.	5	5	8	8	1	3	1	2	3	6	4	9	12	5	17	5	9	5	7	10	9	11	6	5	13	7	15	7	3	5	4	210	31	T.
		A.																																0	0	A.
Maine	17	T.		1		2	5								3									1										12	5	T.
		A.																													3	1		4	2	A.
Maryland	39	T.		22		15	13	2			1	9	8	3	10	13			1				18	2		1		16	6	1				141	17	T.
		A.																																0	0	A.
Massachusetts	54	T.		6			4						1		1								3	18	6	2								41	8	T.
		A.																										1			1	1		3	3	A.
Michigan	107	T.	9	3	13	2				1	5	19	23	4						6	10	7	3	1	2	1		8	1	2	4	4	7	135	22	T.
		A.			1	1																												2	2	A.
Minnesota	64	T.	11	9	3			3	4	14	10	10	12	1		1		4	11	13	23	12		8	19	1	6	3		9	5	6	5	203	25	T.
		A.			1		1																								1	1	1	5	5	A.
Mississippi	42	T.	2	4	9	1		3	4	3	4	4	3	4	13	8	10	7	5	6	4	3	3	5	1	8	5	5	7	6	5	2	6	150	30	T.
		A.																																0	0	A.
Missouri	89	T.	2		3	19	20	12	11	11	15	5	7	17	17	4				4	1	13		11	9	11	8	15	9					224	22	T.
		A.																																0	0	A.
Montana	37	T.	6	4		4	3	4	7	6	2		3	1	6	1			2	2	4	7					1						1	64	18	T.
		A.	1			1									1							1												4	4	A.
Nebraska	145	T.	6	10	20	19	4	3	17	5	1	11	2	23	13	1		4	4	5	6	1	1	5	10	2	9	17	9	1	1	4	5	219	30	T.
		A.																																0	0	A.
Nevada	45	T.			8	8	3	4	5	2								1	1															32	8	T.
		A.																																0	0	A.
New Hampshire	20	T.		5	1	1	4							3									1	7	3	1	1							27	10	T.
		A.																													2	1		3	3	A.
New Jersey	50	T.		28	5	1	14	6				20	5		1	2							21	7	2	2	1	11	3					129	16	T.
		A.														1										1								2	2	A.
New Mexico	38	T.	5	4	2		3		2	1	2				1	1	2	1	2					2	1		1		2				1	33	17	T.
		A.																																0	0	A.
New York	103	T.		42	1	4	6		1			13	6	22		1							37	9	5	1	2	11	4					165	16	T.
		A.			1																										2	1		4	3	A.
North Carolina	56	T.	3	2	1		1	6	2	3	4	8	4	3	4	7	2					1	4	7	1	3	1	6	6	3			1	83	24	T.
		A.																																0	0	A.
North Dakota	40	T.		4			3	1	5	2	2	6	1				3	3	2	3	5	1		5	1					1				48	17	T.
		A.		1	1	1									1															2	2	1	1	10	8	A.
Ohio	124	T.		9	15	16	11	1			3	10	4	3								1	17			1	4	20					1	116	15	T.
		A.				1					1							1															1	4	4	A.
Oklahoma	22	T.						1								4									1	2	4							12	5	T.
		A.																																0	0	A.
Oregon	71	T.					1		2	1				2	2				2	1	3	3	2					1						20	11	T.
		A.																																0	0	A.
Pennsylvania	100	T.	1	32	2	13	16	1			2	30	18	15	7								33	1	1	1	12	30	21	4				240	19	T.
		A.																																0	0	A.
Rhode Island	8	T.					2	1															1		1									5	4	T.
		A.																																0	0	A.
South Carolina	44	T.	6	1			1	1	7	9	2	9	10	6	6	1						3	3	12	3	11	11	6	12	2	2	6	6	136	24	T.
		A.																																0	0	A.
South Dakota	52	T.	8	7	2	1	1	6	8		1	3		4	1		1	6	10	10	12	1	1		6	2	3	1	2	2	7	10	2	118	27	T.
		A.						1																										1	1	A.
Tennessee	61	T.	2			2	11	9	10	2	6	6	5	6	8	2	7	5	1	3		1	5	1		2	2	17	9	7	3	1		133	26	T.
		A.																																0	0	A.
Texas	83	T.	1	1						1		1			1	5	6	4	6	2				2		2				4		4	7	47	15	T.
		A.																																0	0	A.
Utah	34	T.	6	8	5	7	4	11	2	2				1			1	2						1	1	1	1	1	1	5	5	2	1	68	21	T.
		A.																																0	0	A.
Vermont	14	T.		6			1							3									2	3	2	2								19	7	T.
		A.																																0	0	A.
Virginia	47	T.		4	1	3	18	7				4	12	5	9	9							4					12	9					97	13	T.
		A.																																0	0	A.
Washington	55	T.	4						1		3				5					1						1		1						16	7	T.
		A.																			1												1	2	2	A.
West Virginia	38	T.		10	9	5	5	2					7	2	3	3	2				1		4				1	8	10	1				73	16	T.
		A.																																0	0	A.
Wisconsin	60	T.	9	3	9	5	11	10	15	1									5	5	6	5		1	22	6		2	1	3	2	1	9	131	21	T.
		A.			1	1		1																										3	3	A.
Wyoming	18	T.	1			2	1	1	1		1			2	1		1	1	1	1	1			1	1					1	1	1	1	21	16	T.
		A.																																0	0	A.
Sums	2,804	T.	169	302	185	244	250	171	165	114	158	237	217	218	202	110	101	74	88	96	115	135	220	154	158	114	143	264	183	98	78	81	99	4,943	....	T.
		A.	1	1	5	5	1	2	0	0	2	0	0	0	2	1	0	1	0	0	1	1	0	0	0	1	0	1	0	2	12	6	4	49	....	A.

TABLE VIII.—*Average hourly sunshine (in percentages), August, 1899.*

Stations.	Instrument.	Percentages for each hour of local mean time ending with the respective hour.																Hours of sunshine.			
		A. M.								P. M.								Total.			Personal estimate.
		5	6	7	8	9	10	11	Noon	1	2	3	4	5	6	7	8	Actual.	Possible.	Percent of possible.	
																		Hours.	Hours.		
Albany, N. Y	T.	56	32	31	46	67	83	85	89	89	86	93	81	67	57	50	44	295.9	431.3	69	43
Atlanta, Ga	T.	......	63	66	74	83	90	91	94	95	88	87	79	69	55	38	0	322.4	415.8	78	53
Atlantic City, N. J	P.	......	47	43	45	53	63	65	61	66	65	63	58	51	45	34	64	231.1	423.2	55	39
Baltimore, Md	T.	......	24	33	49	52	61	70	73	75	76	65	58	47	34	17	9	225.0	423.2	53	46
Binghamton, N. Y	T.	8	18	20	35	51	65	79	79	81	80	76	70	58	52	38	27	247.7	429.4	58	50
Bismarck, N. Dak	P.	18	34	46	57	65	69	67	61	56	71	71	73	74	67	48	37	267.9	440.0	61	62
Boise, Idaho	P.	60	59	70	68	74	77	80	79	77	85	85	82	75	73	68	82	326.1	433.6	75	61
Boston, Mass	T.	3	25	25	31	46	50	60	69	66	65	59	55	45	44	40	42	210.1	429.4	49	43
Buffalo, N. Y	T.	44	46	55	72	83	89	91	91	88	91	89	85	84	67	61	59	337.4	431.3	78	56
Charleston, S. C	T.	......	42	41	47	65	71	56	63	56	51	46	51	33	33	36	......	206.4	414.0	50	45
Chattanooga, Tenn	T.	......	43	41	62	71	80	88	87	88	76	71	66	58	37	33	100	273.4	417.1	66	59
Cheyenne, Wyo	P.	50	61	77	82	85	82	86	89	79	75	77	73	59	44	32	10	306.1	427.4	72	55
Chicago, Ill	T.	8	42	64	67	72	78	83	90	87	87	90	87	83	63	53	23	321.6	429.4	75	66
Cincinnati, Ohio	T.	......	50	52	56	70	79	92	88	87	93	95	93	87	75	52	36	325.9	423.2	77	57
Cleveland, Ohio	T.	50	50	52	58	60	73	96	93	91	89	85	73	67	52	45	31	300.0	429.4	70	72
Columbia, Mo.	T.	......	54	65	77	82	82	87	92	94	97	95	95	93	89	73	73	357.4	423.2	84	56
Columbus, Ohio	T.	100	62	65	63	76	87	88	90	93	92	84	79	62	55	51	36	318.9	425.2	75	65
Denver, Colo	P.	60	65	80	90	80	92	92	92	83	85	82	76	64	47	30	7	328.8	425.2	77	70
Des Moines, Iowa	T.	0	39	42	48	52	67	73	82	80	76	74	75	61	56	58	50	271.1	429.4	63	53
Detroit, Mich	T.	33	57	75	85	90	96	94	94	95	96	96	95	84	81	63	31	368.2	429.4	86	68
Dodge, Kans	P.	......	69	77	74	81	85	89	85	83	92	92	94	97	83	65	57	353.0	422.1	84	69
Dubuque, Iowa	T.	0	42	44	51	70	76	80	83	89	85	85	84	82	67	62	54	307.5	429.4	72	65
Eastport, Me.	P.	42	31	37	49	51	61	69	67	69	63	61	58	64	53	39	35	239.8	435.6	55	45
Elkins, W. Va.	T.	......	4	3	9	48	71	74	77	73	72	74	57	28	5	4	18	185.4	423.2	44	44
Erie, Pa	T.	38	52	52	60	74	82	91	89	96	95	86	83	71	60	52	42	320.3	429.4	75	58
Escanaba, Mich	T.	23	32	32	32	49	57	60	67	66	58	62	49	42	22	18	9	201.0	437.6	46	46
Eureka, Cal	P.	0	22	21	28	31	35	47	49	60	63	65	60	56	50	49	55	195.5	427.4	46	42
Fresno, Cal.	T.	......	82	87	93	96	95	96	95	95	94	94	95	93	88	84	60	387.3	420.1	92	88
Galveston, Tex	P.	......	33	29	63	72	73	85	82	89	89	85	83	65	42	43	......	279.8	408.0	69	63
Grand Junction, Colo	P.	......	76	73	77	86	81	79	79	67	74	76	73	81	78	72	27	323.7	423.2	76	65
Harrisburg, Pa	T.	60	42	42	46	51	59	72	77	76	72	71	68	48	39	38	36	245.7	425.2	58	45
Helena, Mont	P.	50	53	57	65	71	74	74	64	67	63	70	65	59	55	58	56	281.0	440.0	64	49
Huron, S. Dak	T.	20	35	35	34	45	62	68	70	71	67	65	54	46	45	55	38	232.7	433.6	54	51
Indianapolis, Ind	T.	40	48	52	57	72	81	84	87	86	82	78	74	55	42	41	36	287.0	425.2	67	54
Jacksonville, Fla	T.	......	47	45	63	83	86	83	77	74	64	51	42	32	22	17	......	234.9	409.7	57	47
Kalispell, Mont	T.	35	26	43	60	63	61	73	81	75	82	80	75	55	37	24	4	259.3	442.5	59	40
Kansas City, Mo.	P.	......	45	55	60	63	66	78	75	78	81	83	85	81	74	64	64	300.5	423.2	71	67
Key West, Fla	T.	......	40	47	84	89	86	88	85	86	87	88	82	73	53	42	......	306.4	403.3	76	53
Knoxville, Tenn	T.	......	73	69	69	78	78	90	92	86	85	86	80	69	50	48	100	317.0	418.7	76	70
Lexington, Ky	T.	......	45	53	64	80	85	91	90	92	92	92	90	85	68	54	57	329.5	422.1	78	59
Little Rock, Ark	T.	......	77	77	86	95	97	100	98	96	94	90	88	78	75	70	100	366.8	417.1	88	71
Los Angeles, Cal	P.	......	27	34	43	64	79	85	89	96	96	97	96	95	91	81	0	323.5	415.8	78	69
Louisville, Ky	T.	......	49	49	54	65	70	70	80	87	83	79	72	71	58	44	57	283.1	422.1	67	54
Macon, Ga	T.	......	35	65	76	85	90	95	95	92	91	89	74	59	43	35	......	310.2	414.0	75	47
Meridian, Miss	T.	......	46	45	45	65	74	75	74	76	68	66	51	35	19	20	......	227.5	412.6	55	51
Minneapolis, Minn	T.	16	34	46	54	58	71	73	76	78	70	65	61	54	44	38	41	255.1	435.6	59	......
Mount Tamalpais, Cal	P.	......	66	87	87	92	94	91	88	88	91	92	98	95	94	76	29	373.4	422.1	88	77
Nashville, Tenn	T.	......	28	33	45	61	77	81	82	85	79	72	65	63	40	33	50	256.9	418.7	61	61
New Orleans, La	T.	......	76	70	95	91	95	94	95	94	96	94	89	79	62	53	......	351.1	409.7	86	65
New York, N. Y	T.	100	31	32	45	55	65	71	79	85	81	74	60	54	45	30	55	248.2	427.4	58	45
Northfield, Vt	P.	47	52	62	72	73	72	73	75	80	74	70	69	66	51	41	38	287.3	433.6	66	55
Oklahoma, Okla	T.	......	79	86	90	95	97	98	100	98	100	100	100	98	91	86	100	395.0	417.1	95	88
Omaha, Nebr	P.	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	50
Parkersburg, W. Va	T.	......	24	26	36	42	56	61	68	69	67	70	63	46	36	27	9	211.8	423.2	50	52
Phenix, Ariz	P.	......	77	81	84	84	88	98	90	90	94	92	94	91	79	78	......	360.7	414.0	87	80
Philadelphia, Pa	T.	100	38	36	53	69	76	79	85	86	81	84	74	61	45	31	36	275.6	425.2	65	35
Pittsburg, Pa	T.	50	61	65	77	83	88	82	89	96	90	84	82	72	61	46	35	329.4	427.4	77	67
Pocatello, Idaho	T.	67	66	70	71	77	85	85	87	88	88	83	73	62	58	54	47	322.9	431.3	75	60
Portland, Me	T.	47	45	47	55	69	79	80	85	84	86	85	81	75	52	36	33	296.6	434.6	68	47
Portland, Oreg	T.	12	10	16	20	28	31	39	49	57	53	58	51	47	39	30	44	165.9	437.6	38	36
Raleigh, N. C	T.	......	29	36	50	65	78	84	90	93	86	80	73	57	32	17	8	266.5	418.7	64	48
Rochester, N. Y	T.	22	52	71	72	80	92	94	96	94	96	91	89	87	74	57	31	352.1	431.3	82	73
St. Louis, Mo.	T.	......	50	62	73	78	85	85	79	83	91	87	80	80	71	52	36	321.7	423.2	76	60
St. Paul, Minn	P.	11	31	47	52	57	61	57	55	56	58	51	51	52	49	39	30	221.6	435.6	51	47
Salt Lake City, Utah	P.	50	70	78	74	76	76	76	77	74	71	80	76	71	64	55	30	310.2	427.4	73	65
San Diego, Cal	P.	......	17	17	36	74	91	94	96	96	97	97	95	90	89	87	......	324.4	414.0	78	83
San Francisco, Cal.	T.	......	19	38	43	54	80	90	95	94	97	100	100	88	62	47	0	308.4	422.1	73	67
Santa Fe, N. Mex.	P.	......	71	84	87	89	87	85	82	84	85	85	86	81	73	57	8	342.6	418.7	82	71
Savannah, Ga.	T.	......	70	65	78	82	86	90	94	93	89	78	64	54	38	40	......	303.5	412.6	74	57
Seattle, Wash	T.	0	5	6	11	13	18	35	47	49	46	44	39	27	23	12	6	116.5	442.5	26	30
Spokane, Wash	T.	14	19	22	41	52	55	54	60	60	55	55	50	49	40	29	23	200.4	442.5	45	37
Tacoma, Wash	T.	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Tampa, Fla	T.	......	48	50	65	79	83	84	70	75	75	68	60	48	39	38	......	261.9	406.9	64	34
Topeka, Kans	T.	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	66
Vicksburg, Miss	T.	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	64
Washington, D. C	P.	......	42	46	47	55	58	57	67	67	74	68	61	61	51	41	55	241.8	423.2	57	45
Wilmington, N. C	T.	......	28	26	52	60	68	72	69	65	63	50	52	42	21	16	0	207.9	415.8	50	42
Yankton, S. Dak	T.	3	24	45	59	71	78	82	77	75	81	76	72	71	64	37	25	281.5	431.3	65	49
Basseterre, St. Kitts	T.	......	48	55	81	90	93	91	89	90	87	85	79	76	61	50	......	313.4	393.4	80	46
Bridgetown, Barbados	T.	......	1	46	75	79	81	86	85	83	86	82	71	48	33	19	......	267.5	889.0	69	35
Cienfuegos, Cuba	T.	......	76	77	81	89	91	93	85	91	90	69	47	25	13	13	......	275.0	399.1	69	70
Havana, Cuba	T.	......	62	58	57	71	87	85	85	89	93	80	67	58	55	58	......	290.7	400.2	73	64
Kingston, Jamaica, W. I	T.	......	37	34	80	95	92	89	85	82	73	65	66	39	20	15	......	259.2	394.4	66	43
Port of Spain, Trinidad, W. I.	T.	......	29	29	57	74	78	80	74	70	65	65	61	44	42	49	......	235.6	387.0	61	43
Puerto Principe, Cuba	T.	......	78	77	79	88	92	90	93	83	77	64	50	39	35	35	......	282.9	398.1	71	55
Roseau, Dominica, W. I.	T.	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
San Juan, Porto Rico	T.	......	17	53	85	92	91	89	89	85	88	82	79	67	49	14	......	297.6	394.4	75	56
Santiago de Cuba, Cuba	T.	......	87	86	84	90	92	79	72	75	84	82	71	56	32	12	......	290.4	396.8	73	55
Santo Domingo, Santo Domingo	T.	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Willemstad, Curaçao	T.	......	16	17	43	61	72	79	83	90	93	89	84	67	51	52	......	263.1	388.0	68	45

TABLE IX.—*Accumulated amounts of precipitation for each 5 minutes, for storms in which the rate of fall equaled or exceeded* 0.25 *in any* 5 *minutes, or* 0.75 *in* 1 *hour during August*, 1899, *at all stations furnished with self-registering gages.*

Stations.	Date.	Total duration. From—	Total duration. To—	Total am't of precipitation.	Excessive rate. Began—	Excessive rate. Ended—	Amount before excessive began.	5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
Albany, N. Y.	2	4.20 p.m.	7.00 p.m.	0.95	4.25 p.m.	4.40 p.m.	0.04	0.33	0.53	0.59	0.62										
Atlanta, Ga.	29-30			2.00														0.60			
Atlantic City, N. J.	2	6.17 p.m.	6.40 p.m.	0.65	6.17 p.m.	6.40 p.m.	0.00	0.29	0.64	0.65											
	5	1.45 p.m.	2.30 p.m.	0.57	1.55 p.m.	2.15 p.m.	0.05	0.13	0.31	0.43	0.51										
Baltimore, Md.	26	8.10 p.m.	D. N.	1.63	8.15 p.m.	9.00 p.m.	T.	0.04	0.25	0.49	0.60	0.82	1.00	1.39	1.51	1.56					
Binghamton, N. Y.	12			0.59														0.58			
Bismarck, N. Dak.	18-19			0.51														*			
Boise, Idaho	8			0.07									0.07								
Boston, Mass.	22	6.05 p.m.	7.30 p.m.	1.38	6.09 p.m.	7.20 p.m.	T.	0.22	0.43	0.85	1.06	1.11	1.13	1.15	1.16	1.18	1.21	1.24	1.37		
Buffalo, N. Y.	10			0.22											0.22						
Cairo, Ill.	15			0.55														0.24			
Charleston, S. C.	25	2.11 p.m.	3.54 p.m.	0.63	2.13 p.m.	2.40 p.m.	T.	0.10	0.30	0.41	0.52	0.59	0.60	0.62	0.63						
	27-29	6.10 p.m.	11.36 a.m.	5.89	‡	‡	1.82	0.10	0.25	0.42	0.47	0.56	0.63	0.65	0.72	0.80	0.90	0.97	1.12		
Cincinnati, Ohio	5	D. N.	11.10 a.m.	1.46	6.05 a.m.	6.55 a.m.	0.28	0.05	0.11	0.18	0.35	0.49	0.57	0.74	0.85	0.91	1.01				
Cleveland, Ohio	3			0.50														0.37			
Columbia, Mo.	13	D. N.	10.30 a.m.	1.29	1.22 a.m.	1.50 a.m.	0.06	0.19	0.31	0.59	0.69	0.80	0.85								
Columbus, Ohio	5			0.43														0.43			
Denver, Colo.	3	6.40 p.m.	D. N.	1.22	7.35 p.m.	8.00 p.m.	0.15	0.09	0.30	0.49	0.59	0.68	0.65	0.67							
Des Moines, Iowa	4			0.60														0.57			
Detroit, Mich.	3			0.34														0.24			
Dodge, Kans	6			0.16														0.08			
Duluth, Minn.	10	5.10 p.m.	6.12 p.m.	0.79	5.30 p.m.	6.06 p.m.	0.03	0.08	0.22	0.47	0.53	0.56	0.62	0.70	0.74	0.76					
	19	7.35 a.m.	10.20 a.m.	1.03	7.50 a.m.	8.15 a.m.	0.05	0.10	0.40	0.59	0.69	0.71									
Eastport, Me.	23			0.34											0.34						
Elkins, W. Va.	2			0.40								0.40									
Erie, Pa.	21			0.05														0.05			
Escanaba, Mich.	18	8.02 p.m.	9.55 p.m.	0.96	8.30 p.m.	9.05 p.m.	0.02	0.08	0.20	0.23	0.24	0.27	0.57	0.72	0.73	0.77	0.84	0.93			
Fort Worth, Tex.	18			0.02						0.02											
Fresno, Cal.†																					
Galveston, Tex.	30			0.60									0.59								
Grand Junction, Colo.	4			0.47														0.42			
Hannibal, Mo.	8	1.30 a.m.	9.45 a.m.	4.58	3.55 a.m.	4.33 a.m.	0.78	0.10	0.22	0.37	0.65	0.86	1.07	1.35	1.44	1.47	1.51	1.59			
					7.50 a.m.	9.05 a.m.	3.01	0.08	0.13	0.20	0.25	0.38	0.45	0.49	0.55	0.76	1.08	1.21	1.44		
	10	6.20 a.m.	11.00 a.m.	1.50	6.30 a.m.	7.21 a.m.	0.02	0.15	0.27	0.41	0.55	0.70	0.80	0.89	0.97	1.01	1.32				
Harrisburg, Pa	12	9.18 p.m.	10.20 p.m.	0.83	9.28 p.m.	9.55 p.m.	0.01	0.22	0.44	0.56	0.60	0.75	0.78	0.81							
	26	3.52 p.m.	7.35 p.m.	1.80	4.20 p.m.	5.05 p.m.	0.35	0.17	0.36	0.50	0.70	0.86	0.99	1.14	1.21	1.29	1.32				
Hatteras, N. C.	2	2.00 a.m.	6.30 a.m.	2.17	2.15 a.m.	4.00 a.m.	0.03	0.07	0.16	0.26	0.39	0.49	0.57	0.65	0.72	0.74	0.76	0.91	1.28	1.49	
	15-18	§	§	10.84	§	§	§														
Huron, S. Dak.	19	7.03 p.m.	8.20 p.m.	0.67	7.05 p.m.	7.35 p.m.	T.	0.07	0.21	0.34	0.49	0.56	0.62	0.65							
Indianapolis, Ind.	2	5.40 p.m.	8.06 p.m.	2.53	6.05 p.m.	6.55 p.m.	0.04	0.07	0.19	0.24	0.28	0.50	0.69	0.87	1.12	1.32	1.42				
					6.55 p.m.	7.40 p.m.		1.50	1.54	1.56	1.59	1.62	1.73	2.07	2.26	2.44	2.46				
	9	3.40 p.m.	4.40 p.m.	1.43	3.55 p.m.	4.25 p.m.	T.	0.54	0.90	1.06	1.21	1.33	1.38	1.41							
Jacksonville, Fla.	28	1.05 p.m.	2.20 p.m.	1.15	1.09 p.m.	1.50 p.m.	T.	0.25	0.49	0.72	0.90	0.97	0.98	1.02	1.09	1.12					
Jupiter, Fla.	29			1.74														0.79			
Kalispell, Mont	20-21			0.70														1.12			
Kansas City, Mo.	12	8.45 p.m.	11.50 p.m.	0.52	9.18 p.m.	9.35 p.m.	T.	0.15	0.41	0.50											
	26	11.50 a.m.	2.18 p.m.	1.01	12.38 p.m.	1.03 p.m.	0.03	0.15	0.32	0.63	0.74	0.93									
Key West, Fla.	8	4.10 a.m.	5.30 a.m.	1.22	4.14 a.m.	4.50 a.m.	T.	0.22	0.47	0.72	0.87	0.93	1.09	1.15	1.17	1.19					
Knoxville, Tenn	5			0.45								0.45									
Lexington, Ky.	6	4.00 p.m.	5.15 p.m.	1.64	4.00 p.m.	5.10 p.m.	0.00	0.10	0.18	0.23	0.47	0.63	0.78	0.90	0.99	1.02	1.06	1.37	1.63		
	11	3.20 a.m.	7.20 a.m.	1.19	3.37 a.m.	4.10 a.m.	T.	0.13	0.19	0.36	0.50	0.74	0.80	0.90	0.92						
Lincoln, Nebr.	12	4.38 p.m.	8.09 p.m.	1.06	5.45 p.m.	6.10 p.m.	0.22	0.07	0.11	0.25	0.46	0.58									
Little Rock, Ark.	25	8.11 p.m.	10.30 p.m.	1.24	8.25 p.m.	9.05 p.m.	0.04	0.07	0.17	0.26	0.47	0.77	1.01	1.08	1.13	1.16					
Los Angeles, Cal.	3			0.01																	
Louisville, Ky.	6			0.49														0.47			
Macon, Ga.	10	5.29 p.m.	6.09 p.m.	0.65	5.35 p.m.	6.00 p.m.	0.03	0.12	0.27	0.44	0.57	0.61									
Memphis, Tenn.	27	5.45 a.m.	8.15 a.m.	0.85	5.50 a.m.	6.35 a.m.	T.	0.06	0.14	0.25	0.45	0.56	0.60	0.66	0.78	0.83					
Meridian, Miss.	15	4.56 p.m.	7.25 p.m.	1.11	4.59 p.m.	5.56 p.m.	0.01	0.12	0.28	0.37	0.40	0.44	0.53	0.56	0.59	0.70	0.85	1.07	1.09		
	21	9.18 p.m.	10.45 p.m.	0.97	9.25 p.m.	9.43 p.m.	0.01	0.18	0.42	0.73	0.78	0.79	0.80	0.88	0.93	0.96					
	26-27	10.59 p.m.	D. N.	0.69	11.05 p.m.	11.40 p.m.	0.03	0.12	0.28	0.42	0.46	0.49	0.55								
Milwaukee, Wis.	10			0.75														0.60			
Montgomery, Ala.	27-28	10.25 p.m.	2.15 a.m.	1.08	11.20 p.m.	12.07 a.m.	T.	0.24	0.36	0.43	0.48	0.51	0.60	0.69	0.82	0.97	1.02				
	31	2.00 p.m.	3.30 p.m.	1.72	2.32 p.m.	3.10 p.m.	T.	0.11	0.17	0.57	0.80	1.12	1.48	1.64	1.71						
Nantucket, Mass.	10-11	1.34 p.m.	8.26 a.m.	1.74	5.10 a.m.	6.00 a.m.	0.76	0.06	0.13	0.24	0.32	0.42	0.55	0.59	0.67	0.75	0.80				
Nashville, Tenn.	30	7.30 p.m.	8.30 p.m.	0.66	7.34 p.m.	8.02 p.m.	T.	0.09	0.29	0.41	0.49	0.57	0.62	0.64							
New Orleans, La.	20			0.45														0.41			
New York, N. Y.	10	6.03 a.m.	10.45 a.m.	2.24	7.28 a.m.	7.50 a.m.	0.42	0.05	0.15	0.25	0.40	0.55	0.57								
					9.12 a.m.	9.50 a.m.	1.02	0.27	0.42	0.58	0.83	0.97	0.98	1.00	1.11	1.11	1.13	1.20			
Norfolk, Va.	17-18			0.95														0.21			
Northfield, Vt.	2			0.28														0.15			
Oklahoma, Okla.	25	10.15 a.m.	11.00 a.m.	0.80	10.20 a.m.	10.52 a.m.	0.01	0.07	0.28	0.38	0.45	0.59	0.69	0.78	0.79						
Omaha, Nebr.	7-8			2.24														*			
Parkersburg, W. Va.	11			0.72														0.56			
Philadelphia, Pa.	10	8.37 p.m.	10.45 p.m.	2.05	8.40 p.m.	9.35 p.m.	T.	0.14	0.40	0.69	1.10	1.39	1.48	1.57	1.64	1.77	1.87	1.97	2.00	2.03	2.05
Pittsburg, Pa.	5	3.25 p.m.	5.50 p.m.	0.83	3.37 p.m.	3.47 p.m.	T.	0.28	0.54	0.59	0.60	0.61									
Pocatello, Idaho	8			0.16							0.14										
Portland, Me.	5			0.30								0.30									
Portland, Oreg.	26			0.45														0.19			
Raleigh, N. C.	22	6.50 p.m.	8.25 p.m.	0.86	6.57 p.m.	7.32 p.m.	T.	0.10	0.31	0.46	0.54	0.62	0.75	0.85							
Richmond, Va.	26-27	5.15 p.m.	7.25 a.m.	2.04	3.55 a.m.	4.40 a.m.	0.27	0.12	0.39	0.50	0.60	0.69	0.78	1.13	1.38	1.43	1.48	1.54	1.63	1.68	1.73
Rochester, N. Y.	21			0.17							0.17										
St. Louis, Mo.	6	12.32 a.m.	5.30 a.m.	0.90	12.35 a.m.	12.55 a.m.	0.01	0.12	0.41	0.47	0.50	0.51									
St. Paul, Minn.	24			0.49														0.42			
Salt Lake City, Utah *																					
San Diego, Cal.	17			0.07														0.07			
San Francisco, Cal.	7			T.																	
Savannah, Ga.	27-29	4.08 p.m.	8.30 a.m.	5.71	‖	‖	0.33	0.04	0.10	0.26	0.34	0.48	0.65	0.86	0.95	1.02	1.08	1.19			
Seattle, Wash.	13-14			1.10														0.27			
Spokane, Wash.	26-27			0.62														0.29			
Tampa, Fla.	27	2.35 p.m.	4.30 p.m.	1.50	3.25 p.m.	4.25 p.m.	0.31	0.09	0.34	0.54	0.63	0.74	0.84	0.94	0.99	1.02	1.08	1.19			
Washington, D. C.	13	3.12 p.m.	4.10 p.m.	0.66	3.25 p.m.	3.55 p.m.	T.	0.09	0.30	0.45	0.54	0.61	0.65	0.66							
	14	12.40 p.m.	1.55 p.m.	0.48	12.47 p.m.	1.07 p.m.	T.	0.20	0.27	0.33	0.41										
Wilmington, N. C.	1	9.15 a.m.	10.45 a.m.	1.10	9.15 a.m.	9.58 a.m.	0.00	0.06	0.19	0.44	0.48	0.51	0.63	0.78	0.90	1.04					
	24	3.55 p.m.	7.05 p.m.	1.06	5.46 p.m.	6.28 p.m.	0.10	0.05	0.14	0.16	0.21	0.32	0.50	0.82	0.90	0.93					
Yankton, S. Dak.	2	5.28 a.m.	8.38 a.m.	1.27	6.20 a.m.	6.40 a.m.	0.51	0.22	0.43	0.55	0.64	0.67	0.70	0.73							
	18	6.40 a.m.	7.22 a.m.	1.00	6.43 a.m.	7.05 a.m.	T.	0.37	0.78	0.94	0.98	1.00									
Basseterre, St. Kitts	7			1.17														0.53			
Bridgetown, Barbados	6	1.10 p.m.	7.00 p.m.	0.82	2.32 p.m.	2.50 p.m.	0.22	0.10	0.42	0.52	0.56	0.57									
Cienfuegos, Cuba	6	3.25 p.m.	4.40 p.m.	1.39	3.46 p.m.	4.10 p.m.	T.	0.24	0.64	1.00	1.23	1.32	1.35	1.37	1.38	1.39					
Havana, Cuba	18			0.05														0.05			
Kingston, Jamaica	20			0.28										0.28							

TABLE IX.—*Accumulated amounts of precipitation for each 5 minutes, etc.*—Continued.

Stations.	Date.	Total duration.		Total am't of precipitation.	Excessive rate.		Amount before excessive began.	Depths of precipitation (in inches) during periods of time as indicated.													
		From—	To—		Began—	Ended—		5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
Port of Spain, Trin..	6	3.00 p.m.	3.30 p.m.	0.61	3.00 p.m.	3.25 p.m.	0.00	0.19	0.38	0.51	0.57	0.61	......	......	......	......	......	......	......	......	.....
	7	12.40 p.m.	1.50 p.m.	0.98	1.00 p.m.	1.15 p.m.	0.20	0.09	0.44	0.74	......	......	......	.....	......	......	.....	......	......	......	.....
	12	1.55 p.m.	3.00 p.m.	1.71	2.20 p.m.	2.55 p.m.	0.10	0.18	0.37	0.50	0.72	0.99	1.48	1.61	......	......	......	......	......	......	.....
	30	7.07 a.m.	8.15 a.m.	1.31	7 25 a.m.	8.00 a.m.	0.02	0.06	0.33	0.57	0.86	1.14	1.22	1.27	......	......	......	......	......	......	.....
Puerto Principe, Cuba	25	3.12 p.m.	4.37 p.m.	1.69	3.15 p.m.	4.15 p.m.	0.03	0.15	0.37	0.57	0.68	0.76	0.79	0.93	1.11	1.30	1.45	1.57	1.66	......	.....
San Juan, Porto Rico	7-9	D. N.	5.00 a.m.	6.36	¶	¶	0.26	0.05	0.17	0.30	0.43	0.52	0.57	0.61	0.68	0.74	0.81	0.90	1.12	1.25	1.56
	20	5.47 a.m.	7.00 a.m.	0.92	5.50 a.m.	6.13 a.m.	T.	0.24	0.57	0.72	0.82	......	......	....	.....	......	......	......	......	......	......
Santiago de Cuba	10-11	8.18 p.m.	10.15 a.m.	4.41	12.47 a.m.	1.18 a.m.	0.40	0.18	0.42	0.67	0.83	0.98	1.09	1.12	......	......	......	......	......	......	......
Willemstad, Curaçao..	24	5.43 a.m.	7.50 a.m.	0.87	6.33 a.m.	7.02 a.m.	0.15	0.15	0.18	0.18	0.19	0.44	0.71	......	......	......	......	......	......	......	......

*Self-register out of order. † No precipitation during the month. ‡ From 10:45 p. m. to 11:35 p. m., 28th. § Precipitation from 11 a. m of the 15th to 9:10 p. m. of the 18th was 10 84 inches. The record during the period of excessive rainfall was lost on account of gage being washed away by high tides. ‖ From 7 p. m. to 7:55 p. m , 27th. ¶ From 6:50 a. m. to 9:10 a. m., 8th.

TABLE X.—*Excessive precipitation, by stations, for August, 1899.*

Stations.	Monthly rainfall 10 inches, or more	Rainfall 2.50 inches, or more, in 24 hours. Amt.	Day.	Rainfall of 1 inch, or more, in one hour. Amt.	Time.	Day.
	Inches.	*Inches.*		*Ins.*	*h.m.*	
Alabama.						
Alco		2.80	14			
Clanton				1.45	0 30	12
Madison Station				1.05	1 00	30
Montgomery				1.31	0 45	23
Do				1.02	0 50	27-28
Do				1.70	0 37	31
Newton		3.76	2			
Union Springs		4.10	2			
Arizona.						
Mount Huachuca				2.15	1 00	7
Strawberry				1.22	0 45	31
Arkansas.						
Conway				1.60	1 00	25
Corning				1.90	1 45	27
Lacrosse				2.10	2 00	4
Little Rock				1.00	0 32	25
Newport				1.50	1 20	18
Colorado.						
Pueblo				1.75	0 40	13-14
Connecticut.						
Colchester				1.56	1 00	5
Storrs		3.05	10			
Florida.						
Archer		3.01	7			
Brooksville				1.20	0 40	16
Clermont	11.73	4.50	14			
Do		3.00	27	3.00	2 00	27
Do		2.50	28			
Defuniak Springs	11.80	3.18	6			
Eustis		2.53	10	2.53	1 10	10
Federal Point				1.43	1 00	9
Jacksonville				1.00	0 33	28
Key West				1.09	0 30	8
Kissimmee	11.06	2.95	14			
Macclenny		2.61	27			
New Smyrna		2.60	28			
Pensacola	10.49	3.13	2			
St. Andrews		2.78	30			
Stephensville	10.22	2.90	21			
Tallahassee	11.46	7.45	1-2			
Tampa				1.00	0 42	27
Georgia.						
Augusta				2.14	2 20	10
Bellville	11.37					
Blakely		3.50	2			
Brag				2.00	2 00	20
Clayton		3.00	30			
Crescent	12.00	5.70	28	1.12	1 00	27
Diamond				1.00	1 00	30
Fleming		3.04	28			
Fort Gaines		2.71	2	1.55	1 00	13
Greenbush				1.23	1 15	26
Mauzy		2.84	2			
Quitman		4.45	1-2			
Savannah		5.71	27-29	1.19	0 55	27
Washington		3.56	26			
Westpoint				1.60	1 30	27
Illinois.						
Bushnell				1.13	1 00	20
Carlinville		3.85	8			
Coatsburg		3.90	8			
Griggsville		3.05	8			
Hillsboro		3.63	8	1.00	0 45	12
Laharpe		2.65	20			
Martinton				1.75	0 25	9
Mattoon		2.91	5	2.90	2 30	5
Indiana.						
Bright		2.80	10	2.80	2 00	10
Columbia City		2.51	26			
Evansville				1.48	0 49	26
Fort Wayne		4.78	26			
Indianapolis		2.53	2	2.17	1 15	2
Do				1.33	0 25	9
Paoli		4.15	10	4.15	2 10	10
Richmond		3.71	5			
Vevay		2.60	5			
Washington		3.80	8-9			
Iowa.						
Ames (near)		3.05	4-5			
Belknap		3.50	8			
Carson		3.04	7			
Coon Rapids				1.17	0 45	23
Council Bluffs		2.80	7			
Davenport		2.61	4-5			
Emerson		2.80	4			
Emmetsburg		2.53	18			
Glenwood		2.50	12			
Grand Meadow		3.70	23			
Griswold		2.65	8			
Lamoni		2.50	7			
Lansing		2.83	3			
Mooar		3.20	8			
Northwood		2.90	2			
Osage				2.01	0 37	31
Pacific Junction		2.95	12			
Thurman	10.45	4.10	12	4.10	1 30	12
Waterloo				1.02	1 00	20
Kansas.						
Augusta		2.55	14			
Bunker Hill		6.00	25	6.00	1 30	25

TABLE X.—*Excessive precipitation*—Continued.

Stations.	Monthly rainfall 10 inches, or more.	Rainfall 2.50 inches, or more, in 24 hours. Amt.	Day.	Rainfall of 1 inch, or more, in one hour. Amt.	Time.	Day.
	Inches.	*Inches.*		*Ins.*	*h.m.*	
Kansas—Continued.						
Emporia		2.50	25-26			
Fanning		3.58	26			
Grenola		3.18	14			
Independence		2.81	13-14			
Sedan		3.83	13-14			
Kentucky.						
Bardstown				1.75	0 30	12
Ensor		2.91	9			
Lexington				1.43	0 55	5-6
Do				1.00	0 33	11
Maysville		2.93	5			
Middlesboro		3.32	11-12	2.42	2 00	12
Vanceburg		2.80	11			
Louisiana.						
Donaldsonville				1.60	1 15	15
Emilie				1.21	1 10	22
Franklin				1.55	0 45	16
Jeanerette				1.50	0 10	23
Lake Charles				1.80	0 30	16
Melville				1.80	1 00	28
Prévost		2.63	20			
Robeline				1.48	0 26	14
Do				1.02	0 50	31
Shellbeach				1.86	0 55	15
Maryland.						
Baltimore				1.44	0 32	26
Coleman		3.63	10			
Fallston		2.53	10-11			
Harney		2.70	26			
Jewell		2.55	5			
Pocomoke City				1.02	0 15	2
Rockhall		2.53	10			
Smithsburg		2.77	26			
Sudlersville		2.50	9-10			
Taneytown				1.10	0 40	2
Van Bibber		3.47	10			
Massachusetts.						
Boston				1.09	0 24	22
Chestnut Hill				1.65	0 22	22
Jefferson				2.29	1 30	22
Monson		3.72	23	3.50	1 00	23
Michigan.						
Battle Creek		2.70	10			
Iron Mountain				1.85	0 55	19
Ivan				1.00	1 00	31
Lathrop				1.15	1 00	19
Marquette				1.20	1 07	30
Menominee				1.05	1 00	9
North Marshall				1.65	1 00	10
Thomaston				2.00	1 40	18
Minnesota.						
Ada				1.23	0 40	10
Alexandria				2.40	1 00	17
Beardsley	11.62	2.70	30			
Brainerd		2.50	16-17			
Caledonia		2.83	3			
Long Prairie		3.26	16-17			
Minneapolis (W. B.)				1.03	1 00	23
Minneapolis (V. O.)				1.35	0 30	23
Morris	11.68	3.35	19			
Pine River	10.32	4.43	8			
Pokegama		2.74	16-17			
Mississippi.						
Batesville				2.00	2 00	19
Columbus				1.76	1 00	26
Edwards		3.10	8			
Logtown				1.00	1 00	13
Meridian				1.04	0 59	15
Vicksburg		2.82	3	1.00	0 53	3
Waynesboro		2.50	14	2.50	2 00	14
Windham				1.78	1 00	19
Woodville				2.38	1 00	30
Missouri.						
Birchtree				1.61	1 30	16
Hannibal		4.58	8	1.52	0 38	8
Do				1.10	0 49	8
Do				1.31	0 57	10
Houstonia		2.77	14			
Ironton				1.35	0 55	8
Louisiana		4.35	8			
McCune		2.54	8			
New Palestine				1.63	1 15	5
Do				1.71	1 10	12
Steffenville		4.75	8			
Sublett		2.95	7			
Montana.						
Havre				1.00	1 00	1-2
Nebraska.						
Agee				2.01	2 00	1
Culbertson				1.28	0 40	3
David City		3.00	5			
Fremont		5.53	7			
Genoa		2.53	4			
Grand Island		3.10	3-4			
Haigler				1.06	0 25	3
Harvard				1.04	0 43	10
Hickman		2.50	12			
Johnstown		4.20	16			
Kirkwood		3.05	16			
Nemaha				1.83	0 45	12

TABLE X.—*Excessive precipitation*.—Continued.

Stations.	Monthly rainfall 10 inches, or more.	Rainfall 2.50 inches, or more, in 24 hours. Amt.	Day.	Rainfall of 1 inch, or more, in one hour. Amt.	Time.	Day.
Nebraska—Continued.	*Inches.*	*Inches.*		*Ins.*	*h.m.*	
Omaha		2.88	7-8			
Ravenna		3.52	3-4			
Rulo		2.50	26			
Salem		2.95	27			
Schuyler		2.60	5			
Do		2.82	9			
Syracuse		3.10	13			
Turlington				1.75	0 20	12
Wilber		2.64	14			
New Hampshire.						
Hanover				1.57	0 50	22
New Jersey.						
Atlantic City		2.87	10-11			
Bergen Point		2.76	10			
Beverly				1.28	1 00	2
Billingsport		2.72	10-11			
Bridgeton		3.55	10-11	2.10	1 00	10
Egg Harbor City		4.57	10-11			
Moorestown		2.51	21	2.15	2 00	21
Mount Pleasant		2.56	10			
Newark		2.89	10			
Paterson				1.16	0 45	2
Perth Amboy		2.63	10			
Plainfield				1.16	1 00	10
Salem		3.12	2			
Staffordville		5.46	10			
Trenton		3.13	10			
Tuckerton		6.15	10-11	1.90	0 30	11
Vineland		3.21	10			
New Mexico.						
Aztec				1.05	0 40	2
San Marcial				1.40	1 00	25
New York.						
Jamestown				1.00	0 45	2
New York				1.10	0 39	10
Nunda				1.75	1 30	21
Volusia				1.50	0 30	2
Waverly		3.46	26-27			
North Carolina.						
Charlotte		2.52	27	1.80	1 00	27
Edenton		4.40	17			
Hatteras	14.19	2.57	15-16			
Do		5.50	17-18	1.00	1 00	18
Horsecove		2.87	29			
Marshall				1.35	1 10	13
Monroe				2.00	1 00	8
Pantego	12.60	8.48	16-18			
Waynesville				1.01	0 50	25
Wilmington				1.04	0 43	1
North Dakota.						
Fullerton		5.20	19-20			
Ohio.						
Bethany		3.38	5			
Cincinnati				1.00	0 48	8
Delaware				1.22	0 30	5
Dupont		4.25	3-4			
Hudson		3.33	4-5			
New Paris		5.43	5			
Ripley		3.60	11	3.60	2 00	11
Springboro		4.35	5			
Vanceburg		2.50	10-11			
Warsaw				2.29	1 00	4
Do				1.58	1 00	26
Oregon.						
Bay City				1.08	0 40	9
Pennsylvania.						
Altoona		3.40	28			
Aqueduct		3.90	27	1.77	1 20	12
Athens		2.79	27			
Beaver		2.87	10			
Bethlehem		3.10	27			
Browers Lock		3.14	27			
Carlisle	10.09	9.35	26-27	1.84	0 35	26
Coatesville				1.32	0 30	10
Coopersburg		3.10	27			
East Mauch Chunk				1.65	0 25	10
Easton		3.95	26-27			
Girardville		3.00	27			
Harrisburg		2.67	26-27	1.29	0 45	26
Lawrenceville		4.20	26-27			
Leroy		3.36	26-27	1.55	0 45	26
Lewisburg		4.63	27			
Lockhaven		3.60	27			

TABLE X.—*Excessive precipitation*—Continued.

Stations.	Monthly rainfall 10 inches, or more.	Rainfall 2.50 inches, or more, in 24 hours. Amt.	Day.	Rainfall of 1 inch, or more, in one hour. Amt.	Time.	Day.
Pennsylvania—Continued.	*Inches.*	*Inches.*		*Ins.*	*h.m.*	
Philadelphia		2.89	9-10	1.92	0 53	10
Towanda		3.33	27			
York		3.17	11			
Rhode Island.						
Kingston		4.89	10-11			
Narragansett		3.39	10-11			
South Carolina.						
Allendale	16.59	3.00	14-15			
Batesburg				1 10	0 30	26
Beaufort	10.51	3.69	28			
Blackville		2.84	26-27			
Charleston		4.24	28-29			
Georgetown		5.50	28-29			
Kingstree		2.96	29-30			
Pinopolis	17.90	2.90	8			
Do		8.00	27			
St. Georges	10.34					
St. Stephens	10.81					
Shawsfork		2.55	10			
Spartanburg				1.30	1 13	21
Statesburg				1.15	0 52	8
Summerville	15.42	7.51	29-30			
Trial		2.72	27	1.59	1 15	8
South Dakota.						
Aberdeen		2.60	19			
Ipswich		4.95	21			
Parker		2.52	6			
Redfield		3.21	16			
Whiteswan		3.60	7	3.60	2 30	7
Do		2.95	16-17			
Yankton				1.18	1 00	2
Do				1.00	0 27	18
Tennessee.						
Milan				1.50	1 10	19
Nunnelly				1.40	1 00	13
Texas.						
Jasper				1.40	1 00	3
Sabine Pass		3.29	18			
Virginia.						
Buckingham		4.25	26-27			
Farmville		3.52	27			
Fontella		4.65	26	4.00	4 00	26
Lynchburg				1.08	0 45	14
Miller School		2.70	6			
Richmond				1.38	0 40	27
Stanardsville				1.22	1 00	13
Warrenton		3.92	28			
West Virginia						
Cairo		3.80	2			
Eastbank				1.00	1 00	2
Harpers Ferry		3.75	27-28			
Madison		3.00	2			
Upper Tract				1.24	0 30	12
Wisconsin.						
Delavan				1.30	0 30	11
Wyoming.						
Wamsutter				1.25	0 50	16
Porto Rico.						
Adjuntas	32.22	23.00	7-8	23.00	23 00	7-8
Bayamon	18.02	6.12	7-8			
Canovanas	12.58	7.15	8			
Cayey	15.39	11.62	8			
Fajardo		5.00	8			
Guayama		5.00	8			
Isabella	15.00	11.20	9			
Juana Diaz	15.71	11.20	8-9			
La Isolina	22.16	18.00	7-9			
Lajas	22.07	8.20	8			
Do		11.20	31	11.20	2.00	31
Luquillo	13.65	9.00	7-8			
Manati	11.99	9.50	8-9			
Mayaguez	19.02	8.40	8			
Do		5.00	29			
Puerto de Tierra		5.20	8			
Vieques		5.30	8			
West Indies.						
Cienfuegos				1.32	0 25	6
Port of Spain		2.50	12-13	1.59	0 33	12
Do				1.14	0 23	30
Puerto Principe		2.59	24-25	1.50	0 53	25
San Juan	10.38	6.26	8-9			
Santiago de Cuba		4.95	10-11	1.07	0 27	11

TABLE XI.—*Data furnished by the Canadian Meteorological Service, August, 1899.*

Stations.	Pressure.			Temperature.				Precipitation.		
	Mean not reduced.	Mean reduced.	Departure from normal.	Mean.	Departure from normal.	Mean maximum.	Mean minimum.	Total.	Departure from normal.	Depth of snow.
	Ins.	*Ins.*	*Ins.*	°	°	°	°	*Ins.*	*Ins.*	*Ins.*
St. Johns, N. F	29.79	29.93	—.06	57.6	— 2.2	65.4	49.7	1.61	....	
Sydney, C. B. I	29.97	30.01	+.05	62.4	— 0.9	72.2	52.6	1.94	—1.96	
Halifax, N. S	29.91	30.02	+.04	66.2	+ 2.6	75.4	57.0	1.59	—1.97	
Grand Manan, N. B	29.96	30.01	+.05	61.8	+ 0.3	69.5	54.2	1.04	—2.05	
Yarmouth, N. S	29.95	30.03	+.03	62.2	+ 2.0	69.8	54.5	1.49	—1.74	
Charlottet'n, P. E. I	29.94	29.98	+.03	65.5	+ 1.2	74.1	57.0	1.48	—1.92	
Chatham, N. B	29.96	29.98	+.04	65.2	+ 2.0	75.7	54.7	1.02	—3.12	
Father Point, Que	29.93	29.96	+.05	55.9	+ 0.3	65.4	46.4	1.52	—1.04	
Quebec, Que	29.66	29.98	+.03	65.3	+ 2.2	74.6	56.0	2.52	—0.90	
Montreal, Que	29.76	29.96	+.01	69.3	+ 2.9	77.6	61.0	2.52	+0.35	
Bissett, Ont	29.41	30.01	+.07	63.1	+ 1.6	79.8	46.4	0.16	—2.77	
Ottawa, Ont	29.65	29.96	......	69.4	+ 4.6	80.7	58.2	0.44	....	
Kingston, Ont	29.68	29.99	+.02	69.0	+ 2.0	77.7	60.2	0.38	—1.61	
Toronto, Ont	29.62	29.99	.00	70.3	+ 4.3	82.3	58.3	0.27	—2.31	
White River, Ont	28.67	29.99	+.01	60.2	+ 3.8	72.5	47.8	3.57	+0.51	
Port Stanley, Ont	29.36	29.98	—.01	68.6	+ 2.7	79.9	57.4	0.35	—2.04	
Saugeen, Ont	29.30	30.00	+.02	66.0	+ 2.2	75.8	56.2	0.78	—1.00	
Parry Sound, Ont	29.32	29.99	+.02	66.5	+ 3.0	78.1	54.8	0.66	—2.02	
Port Arthur, Ont	29.25	29.93	.00	60.8	+ 1.3	69.6	51.9	3.76	+1.39	
Winnipeg, Man	29.08	29.88	—.03	63.2	— 0.2	75.7	50.8	3.42	—0.04	
Minnedosa, Man	28.10	29.87	—.02	60.5	+ 1.1	73.4	47.5	1.48	—0.38	
Qu'Appelle, Assin	27.61	29.81	—.09	59.0	— 2.5	70.7	47.2	1.36	—0.11	
Medicine Hat, Assin.	27.56	29.80	—.10	61.3	— 4.4	73.1	49.6	4.60	+3.61	
Swift Current, Assin.	27.32	29.84	—.08	59.4	— 4.6	70.6	48.3	4.75	+3.01	
Calgary, Alberta	26.33	29.80	—.10	53.7	— 5.7	64.3	43.2	9.40	+7.63	
Banff, Alberta	25.30	29.90	......	50.2	....	60.5	39.8	5.47	....	
Edmonton, Alberta	27.57	29.83	—.08	56.1	— 2.7	66.3	46.0	6.43	+4.60	
Prince Albert, Sask	28.27	29.78	......	56.1	— 2.8	66.2	45.9	8.01	....	
Battleford, Sask	28.13	29.83	......	58.7	— 3.9	69.2	48.3	4.32	....	
Kamloops, B. C	28.63	29.88	......	62.5	....	71.4	53.6	3.73	....	
Esquimalt, B. C	29.94	29.97	......	58.2	— 0.9	66.4	50.0	1.28	....	
Hamilton, Bermuda.	29.84	30.00	—.10	79.4	— 0.2	84.8	74.0	5.64	....	
Barkerville, N. W. T.	25.61	29.84	......	50.9	....	61.8	39.9	2.88	....	

Chart I. Tracks of Centers of High Areas, August, [illegible]

Chart I. Tracks of Centers of High Areas. August, 1899.

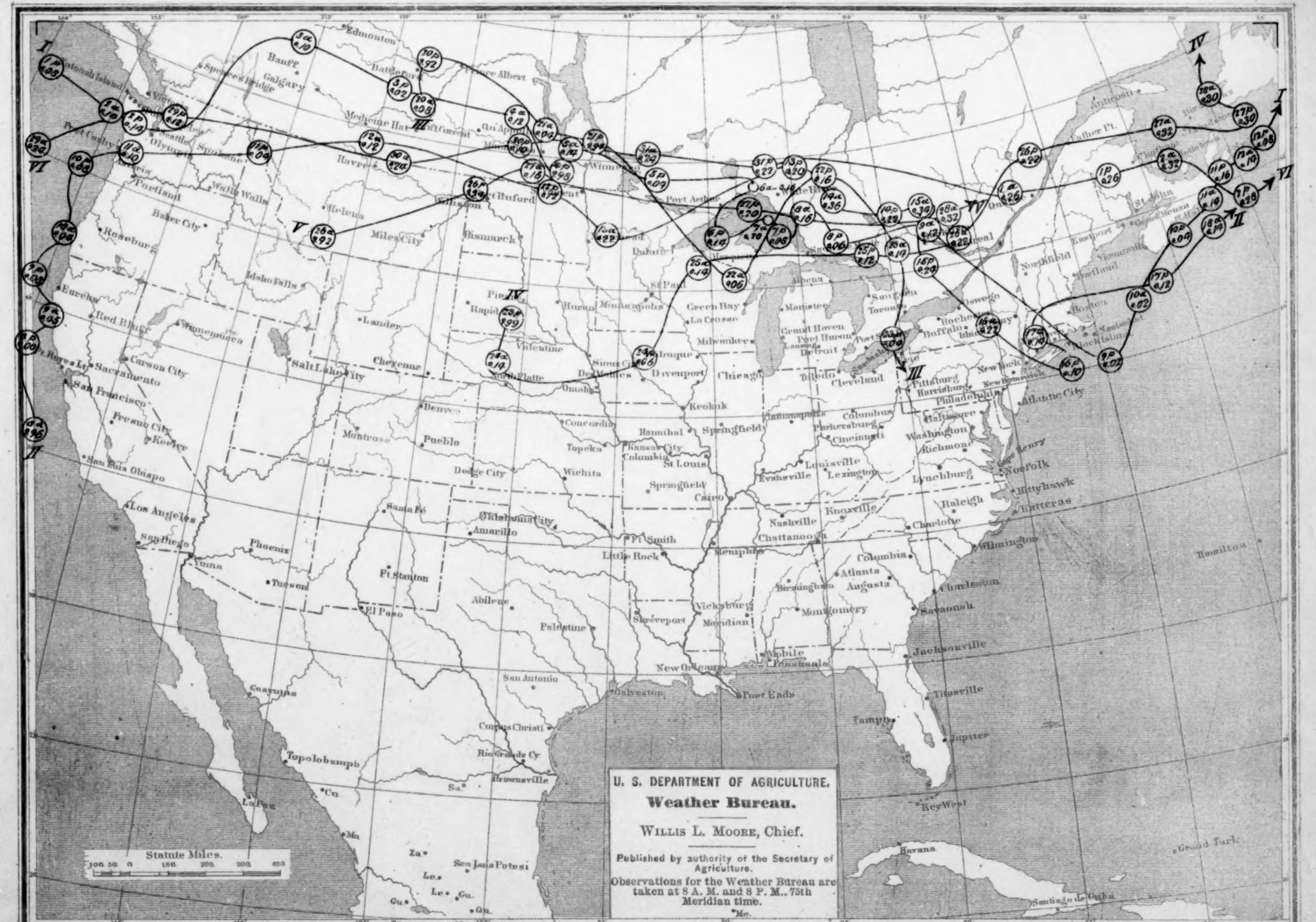

Chart II. Tracks of Centers of Low Areas. August, 1899.

Chart III. Total Precipitation. August, 1899.

Chart III. Total Precipitation. August, 1899.

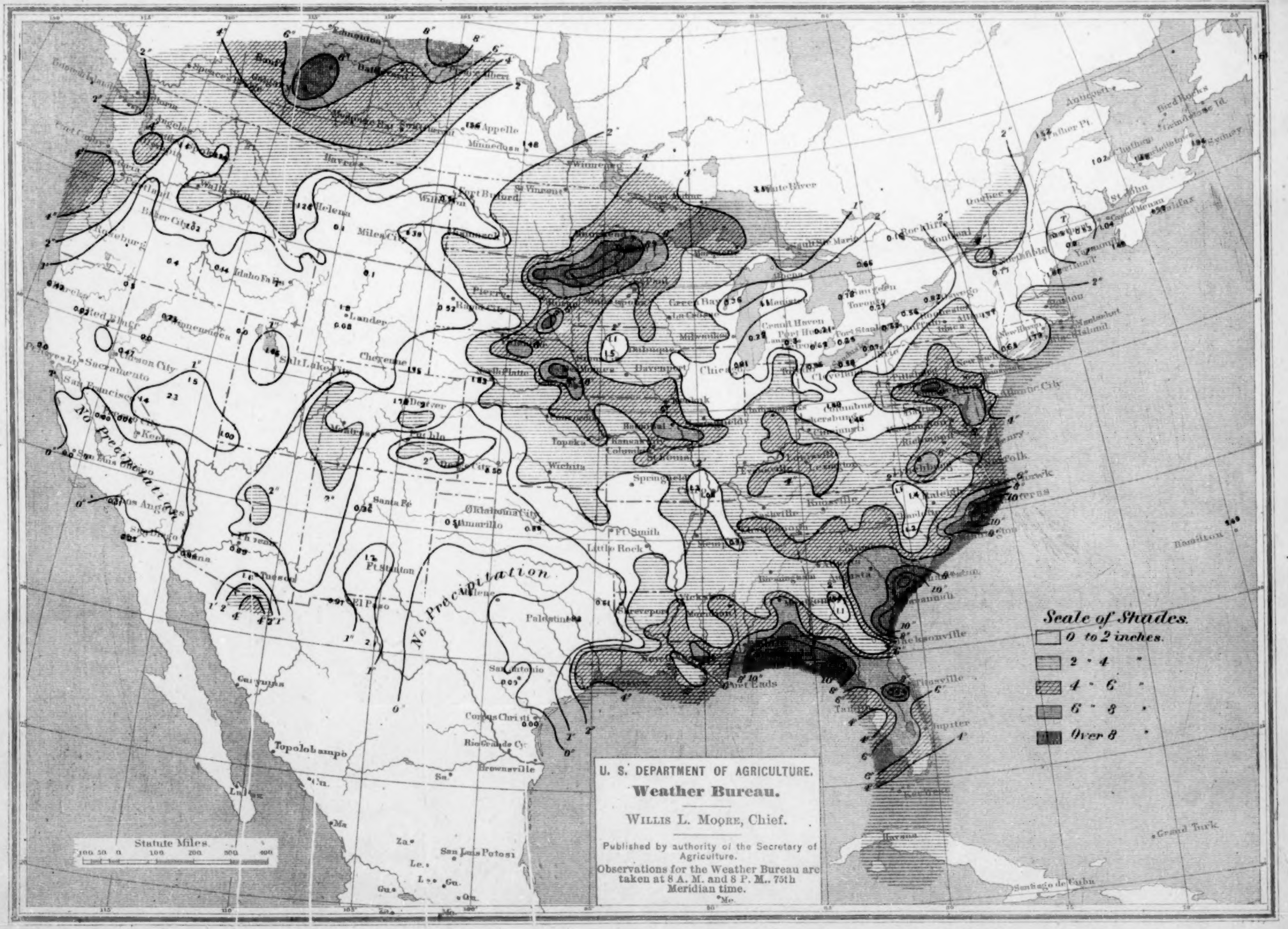

Chart IV. Sea-Level Pressure and Temperature; Resultant Surface Winds. August, 1899.

Chart V. Hydrographs for Seven Principal Rivers of the United States. August, 1899.

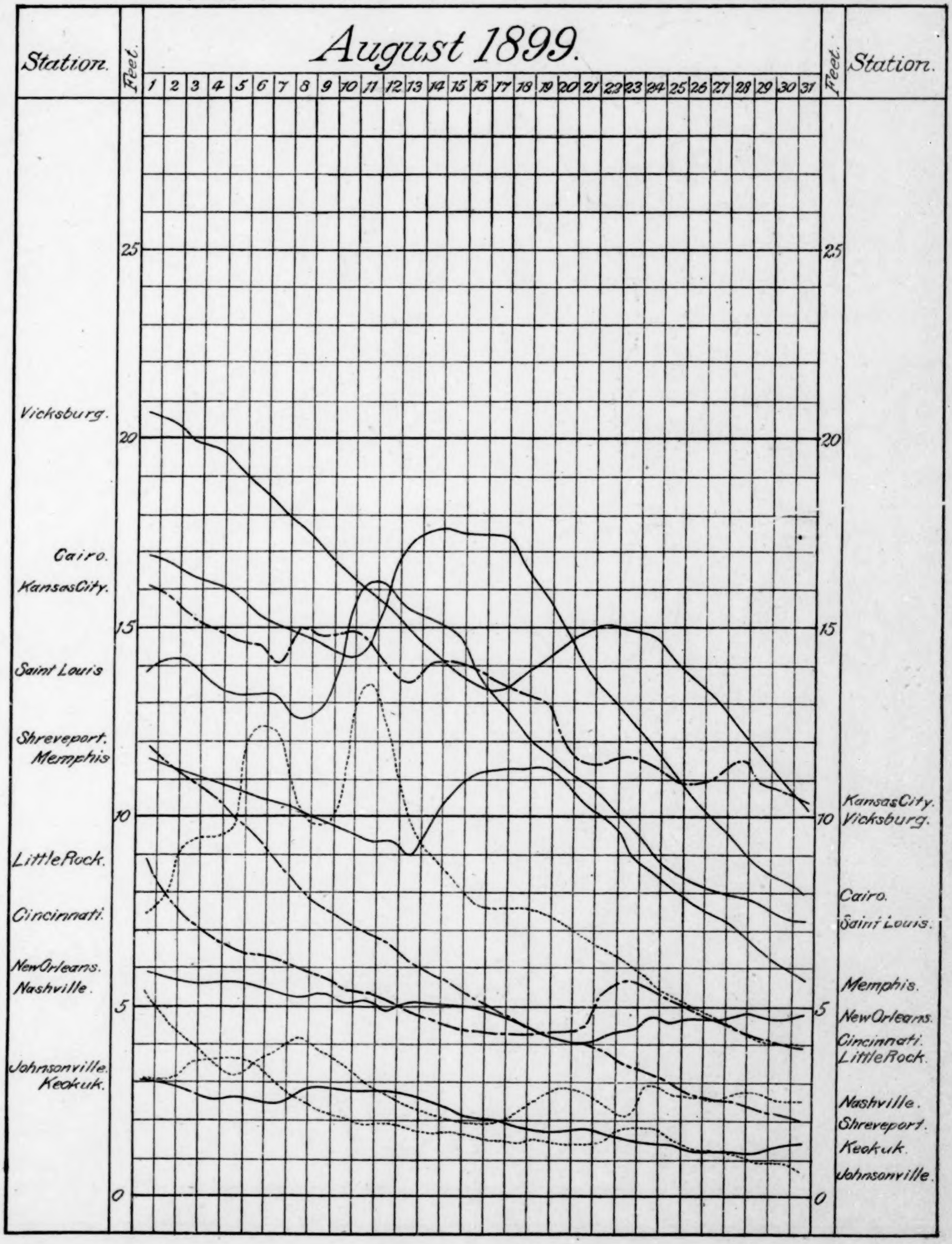

Chart VI. Surface Temperatures; Maximum, Minimum, and Mean. August, 1899.

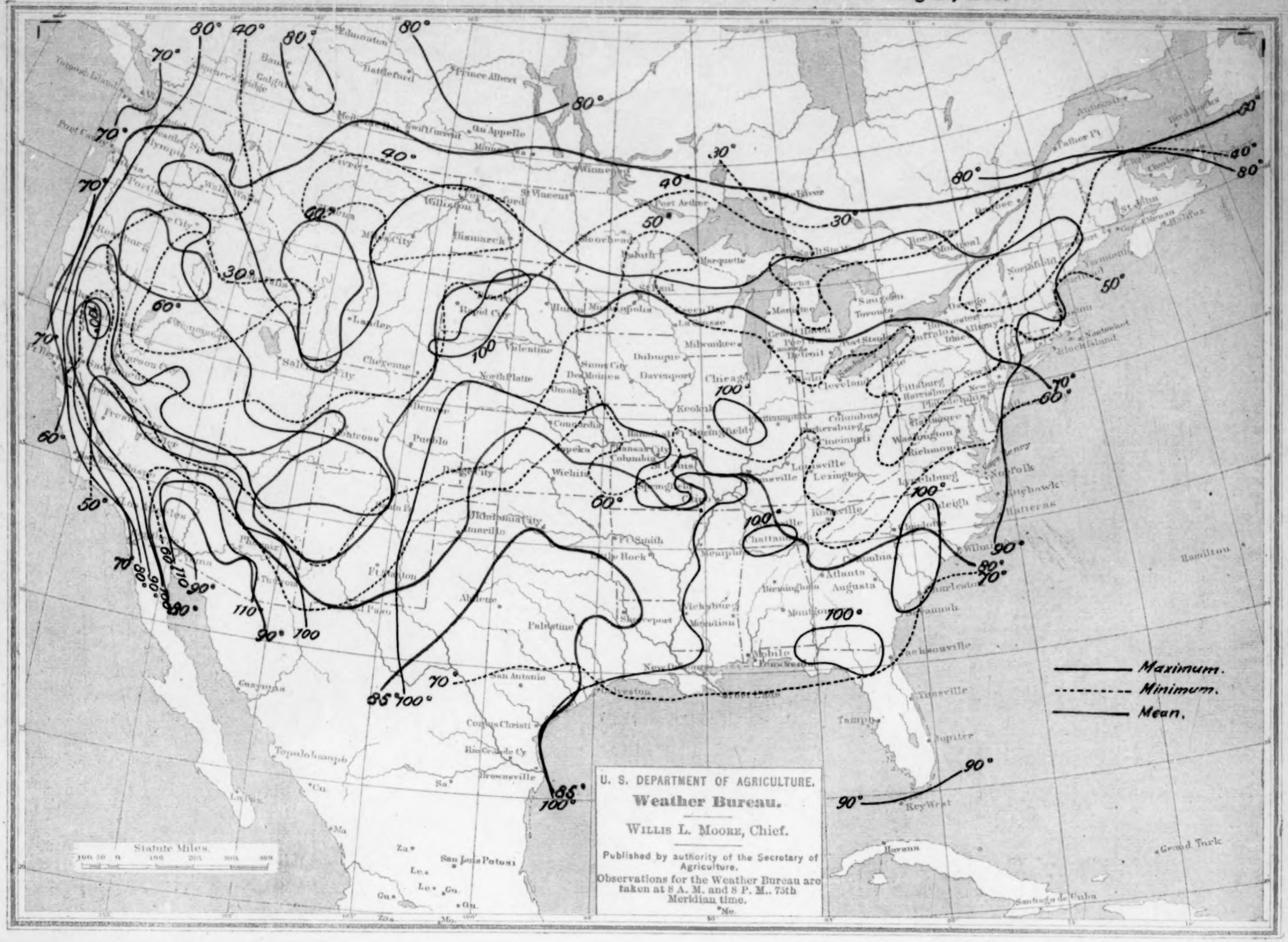

Chart VII. Percentage of Sunshine. August, 1899.

Chart VIII. West Indian Monthly Isobars, Isotherms, and Resultant Winds. August, 1899.

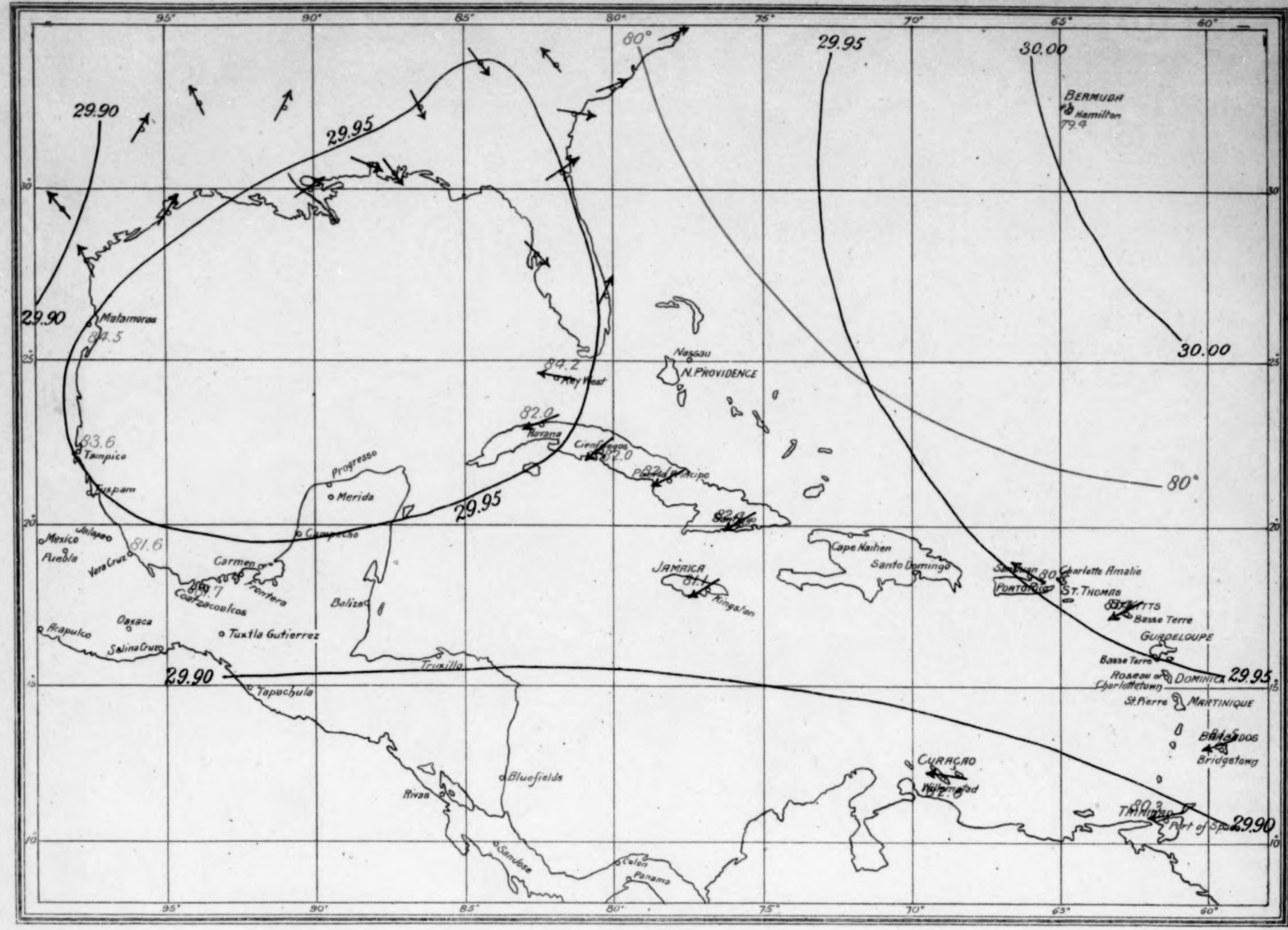

Chart IX. West Indian Hurricane Isobars, 8 a. m., August 7, 1899.

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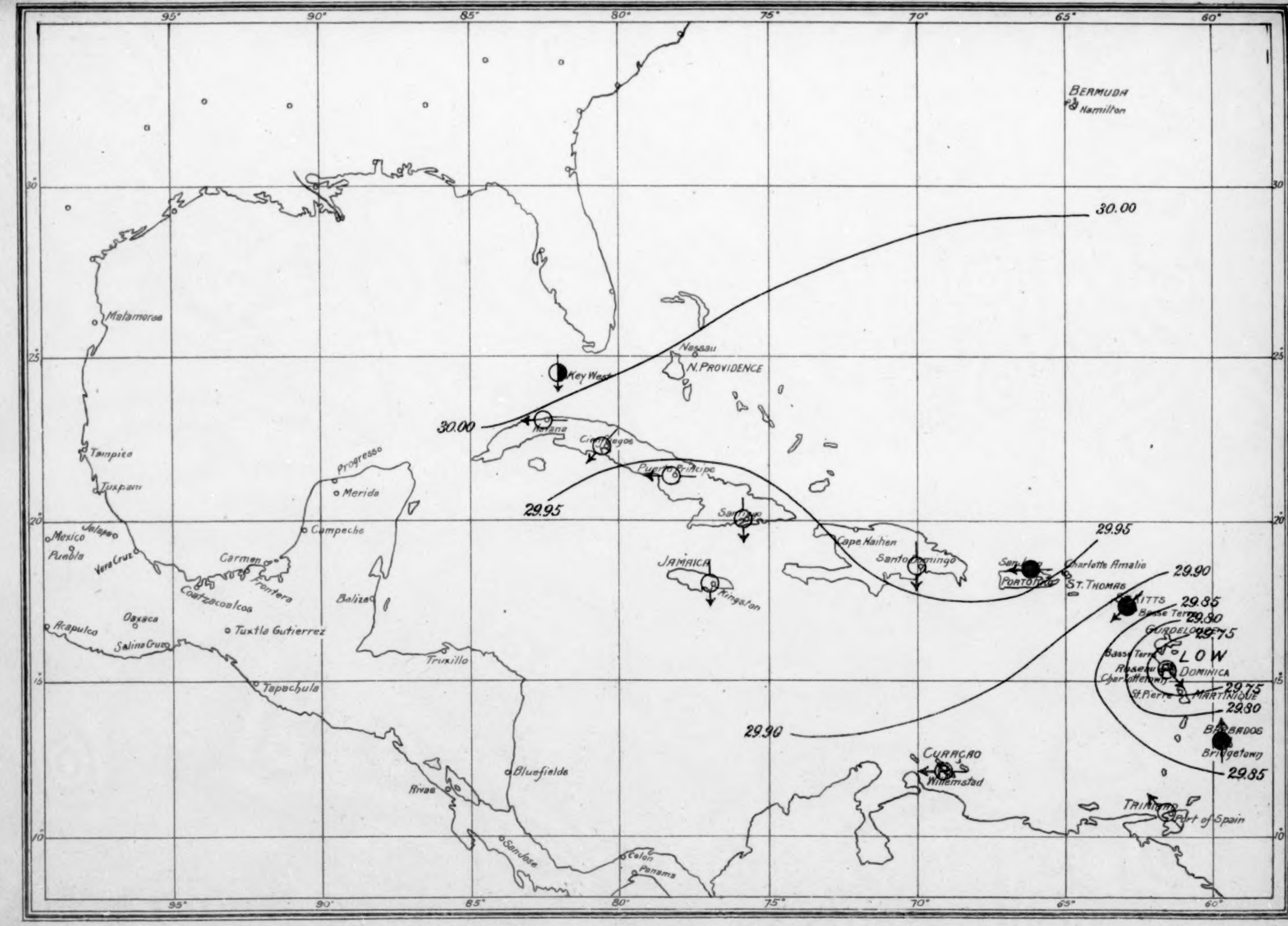


Chart X. West Indian Hurricane Isobars, 8 a. m., August 8, 1899.

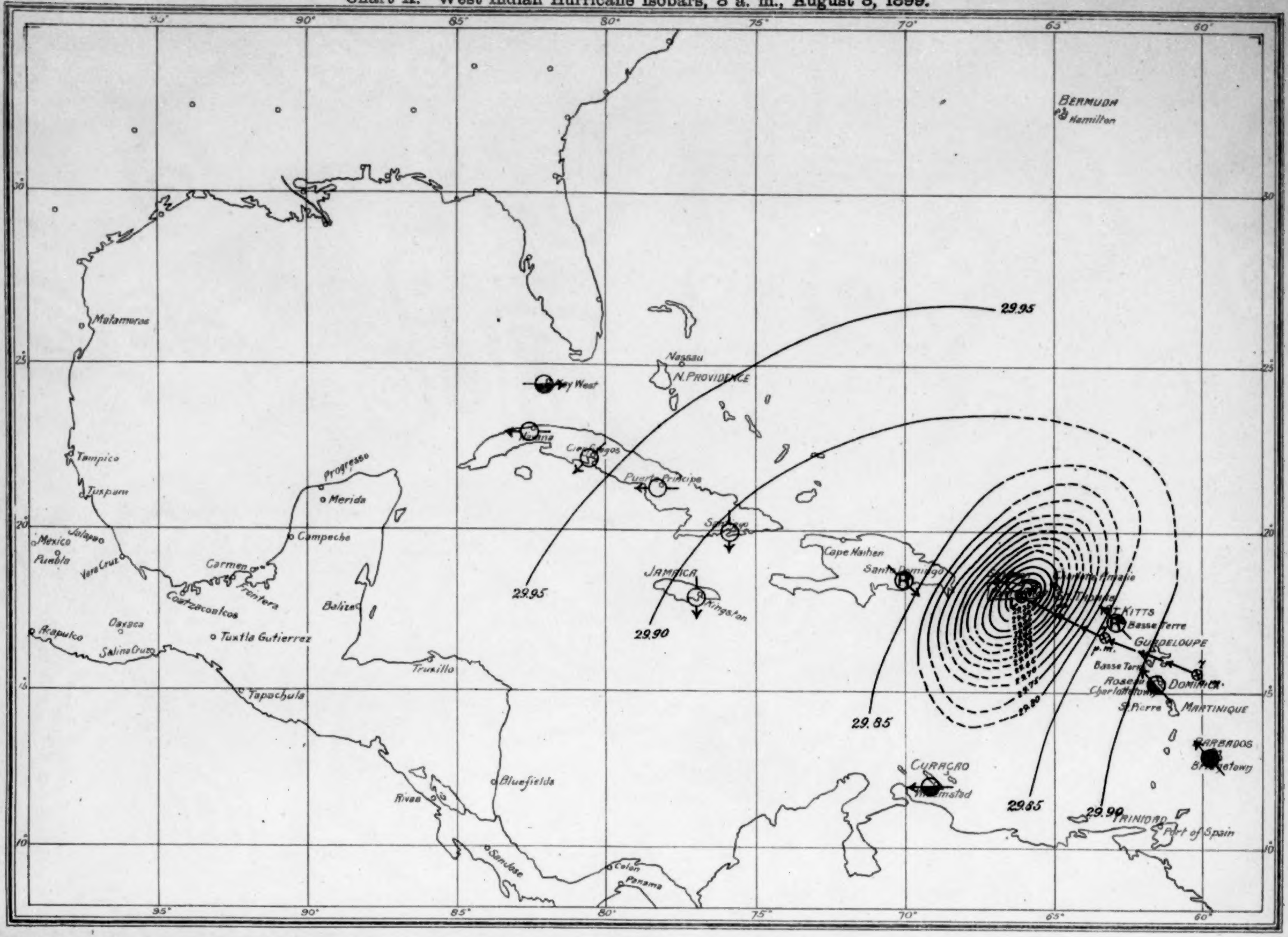


Chart XI. West Indian Hurricane Isobars, 8 a. m., August 13, 1899.

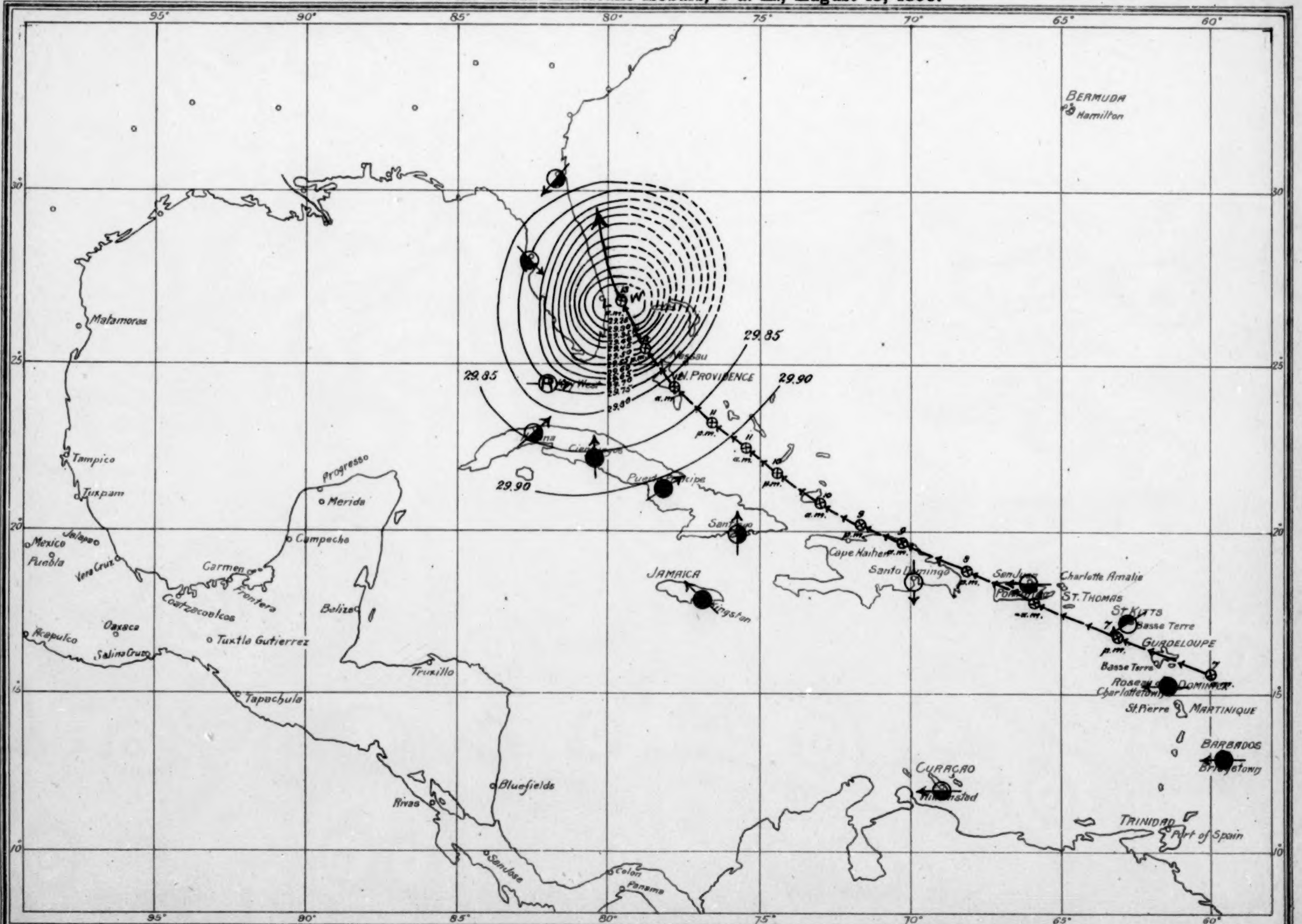


Chart XII. West Indian Hurricane Tracks for August, 1899.

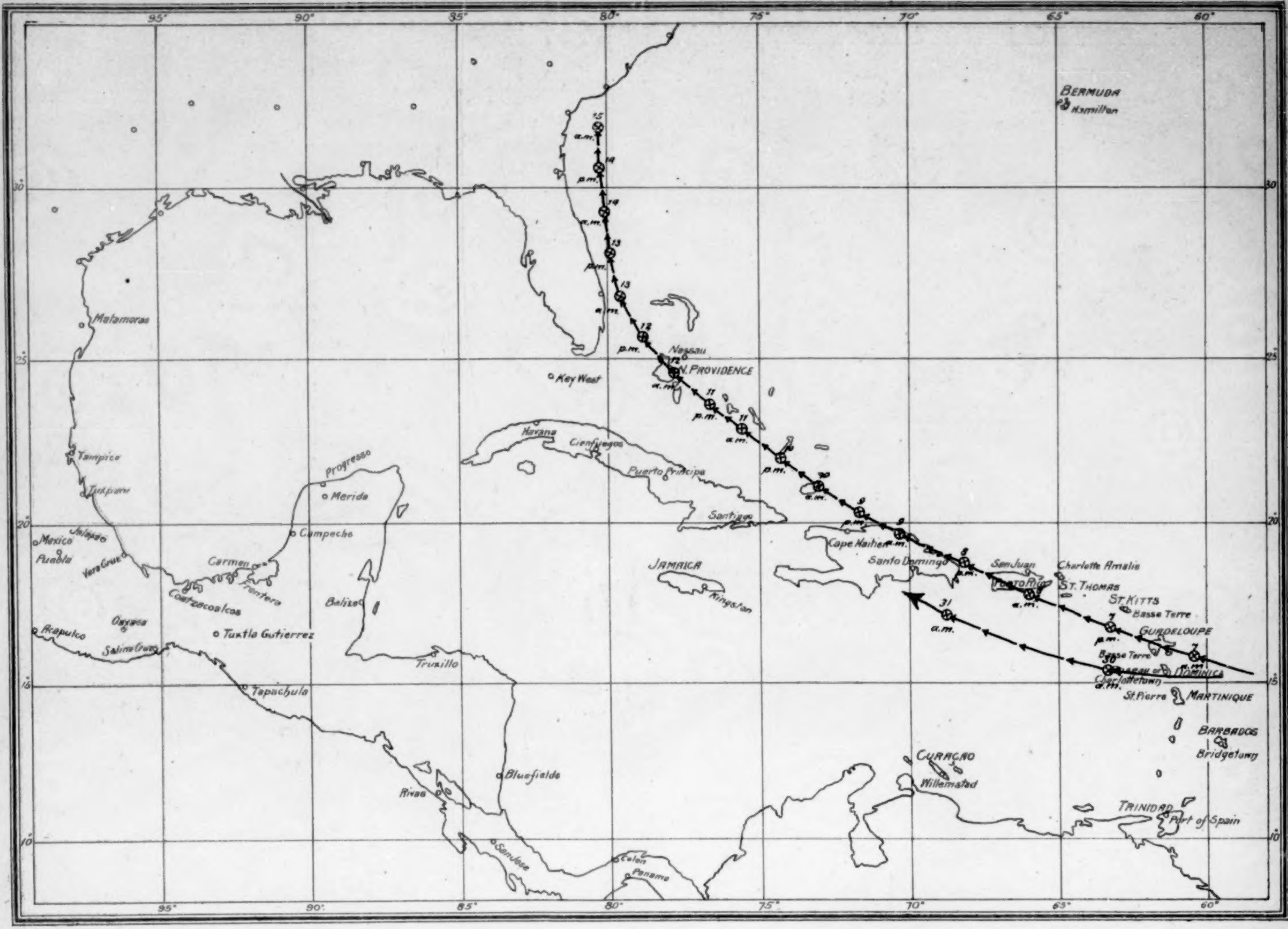
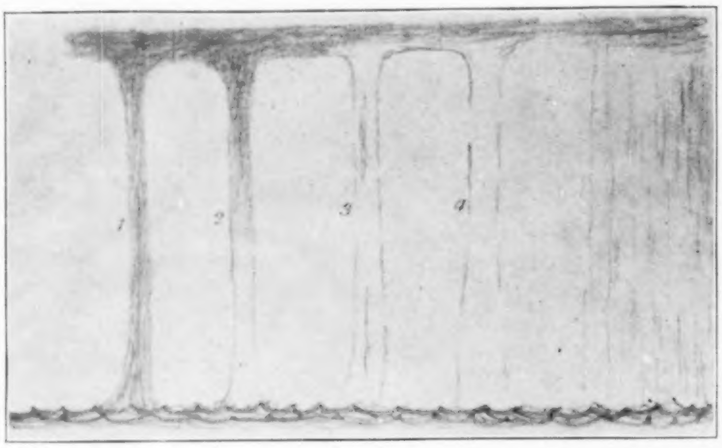


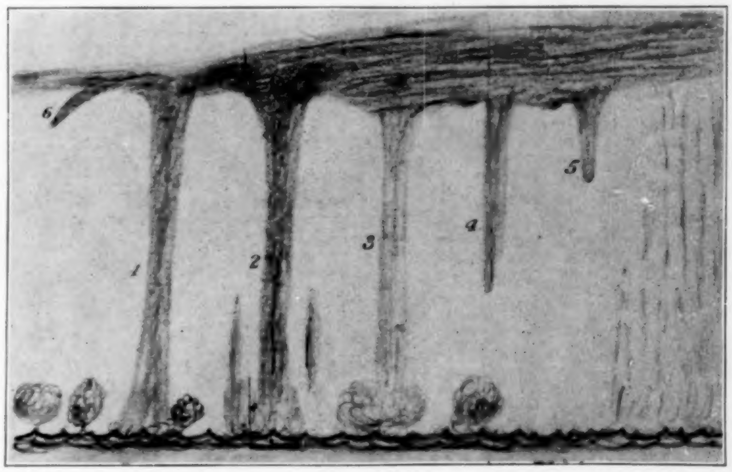
Plate I. Waterspout phenomena observed at Key West, Fla., May 26, 1899.

Fig. 1.—First phase, observed at 7:35 a. m.



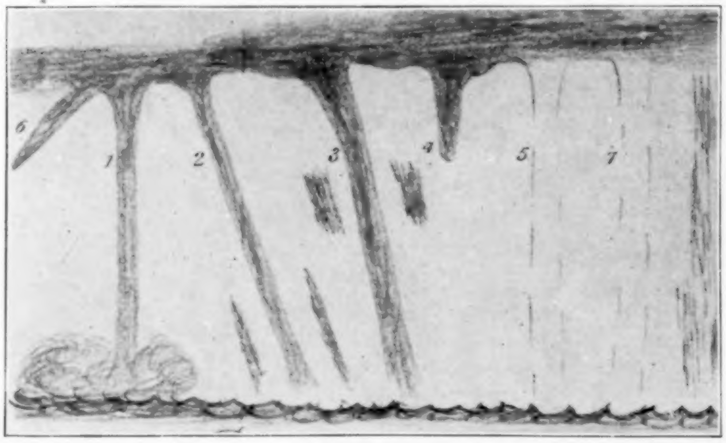
Nos. 1, 2, 3, and 4 forming at rather irregular intervals.

Fig. 2.—Second phase, observed at 7:45 a. m.



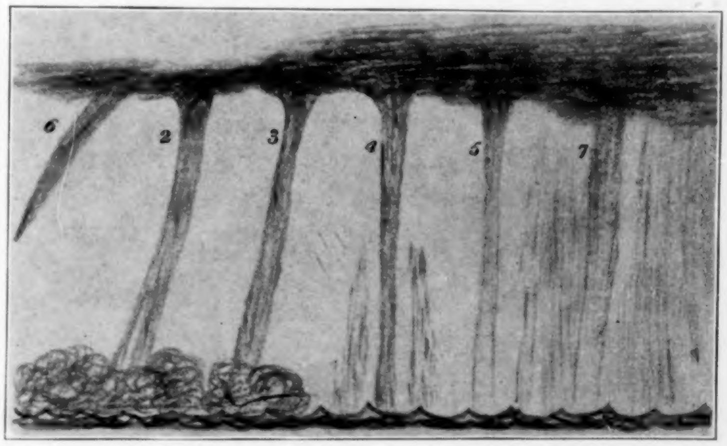
Nos. 1, 2, and 3 foaming at base. No. 6 is a convex spur, 3° long, growing into a waterspout.

Fig. 3.—Third phase, observed at 7:52 a. m.



No. 2 leaning at an angle of 45° and the rising water at its base (seemingly) separate from the waterspout. No. 3 at an angle of 50° and a volume of water half way up the trunk and on each side of it but, seemingly, separate from the trunk. No. 6 growing slowly. No. 4 drawing up. Nos. 5 and 7 merely outlined.

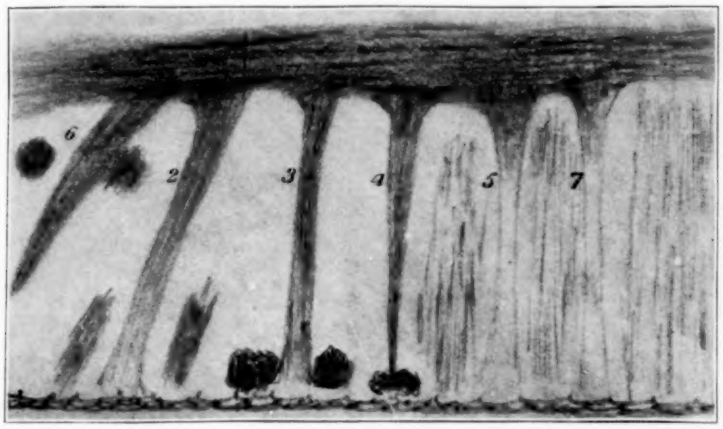
Fig. 4.—Fourth phase, observed at 8:00 a. m.



No. 1 has disappeared. Nos. 2 and 3 are at an angle of 50°. No. 4 has a volume of water on each side of column but not touching trunk. Nos. 5 and 7 have well-defined outlines and a considerable amount of water diffused between them.

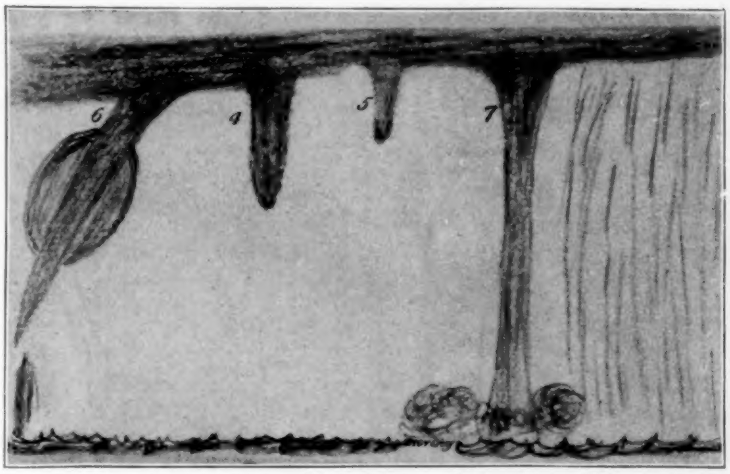
Plate II. Waterspout phenomena observed at Key West, Fla., May 26, 1899.

Fig. 5.—Fifth phase, observed at 8:04 a. m.



No. 6 still growing and a volume of water accumulated on each side of trunk. No. 2 still leaning about 50°. No. 4 was the only waterspout during the whole series that presented the typical pointed appearance; all the others were of uniform size. Nos. 5 and 7 have plain outlines, although the spaces between Nos. 4, 5, and 7 are quite misty.

Fig. 6.—Sixth phase, observed at 8:07 a. m.



At 8:06 No. 3 passed by No. 2 moving briskly but moving from the same direction which shows that there was a parallel current of air at the same time, but of greater force. In fifteen seconds after passing by No. 2, No. 3 disappeared; in fifteen seconds more No. 2 disappeared. No. 6 has water collected around the trunk in double convex form. Nos. 4 and 5 have drawn up and No. 7, well defined, has moved to the left.

Fig. 7.—Seventh phase, observed at 8:09 a. m.

No. 6 has taken the shape of a curved dagger; at no time did it reach to the sea, but the last two phases caused commotion in the water below it. Nos. 4, 5, and 7 have disappeared and the spout region has cleared. The last of this phenomena disappeared at 8:10 a. m.